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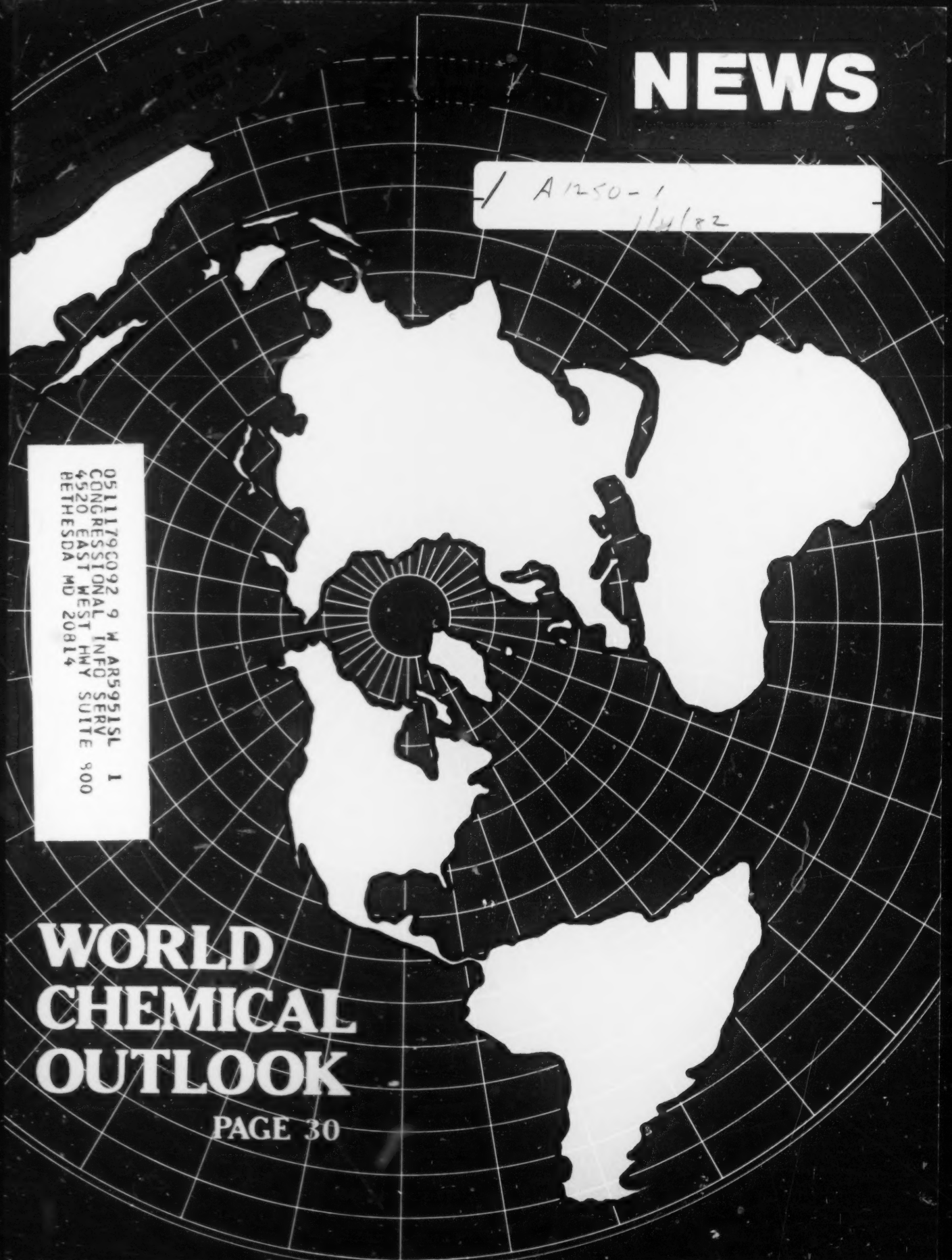

WORLD CHEMICAL OUTLOOK

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- ***Soviet decision to yield to Andrei Sakharov*** *and his wife in their hunger strike seen as unprecedented concession.* ***Page 7***
- ***Du Pont workers reject United Steelworkers of America*** *in elections at 14 of the chemical company's plants.* ***Page 8***
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- ***1981 Chem Show*** *unveils new process equipment: exhibitors this year showed a wide range of equipment for waste incineration and materials recovery.* ***Page 27***

World Chemical Outlook

World's chemical economy *faces a year in which growth will be slight or nonexistent as worldwide business recession undercuts demand and forces producers to restructure operations.* ***Page 30***

Meetings

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Major global changes ahead for plastics

Demand, capacity, and prices will rise, but competition will lower profits, trigger shakeout of producers in major industrial countries

Bruce F. Greek
C&EN, Houston

Some dramatic changes are in store globally in the remainder of this decade for plastics makers. Besides the expected upward changes in production, capacity, and prices, it's likely that real profitability will decline as will the number of producers in major industrial countries and exports from all industrial countries. These were some of the conclusions at a conference on International Plastics Outlook: Markets and Issues, held in New York City earlier this month.

Other changes discussed will be new technologies, much more interpolymer competition, new pricing methodology, and marketing of more fabricated forms by polymer producers. Some of these changes will be in areas seen only dimly now. They might be as unexpected as was the commercialization of linear low-density polyethylene when the decade of the 1970's opened.

Specific conclusions at the conference dwelt more on individual polymer problems and opportunities, which, as expected, will vary widely in different countries. For example, the current worldwide overcapacity in most major volume plastics will last well into the 1980's, forecasts Robert J. Bauman of Chem Systems. However, polypropylene producers will be the most fortunate of polymer makers. By 1985, worldwide demand for polypropylene will exceed expected operable capacity by a small amount. This will be in sharp contrast with the current situation when 1980 demand for the polymer accounted for 77% of effective capacity. Present effective capacity is estimated at 90% of nameplate capacity of nearly 6.5 million metric tons.

Of the other major-volume plastics, polystyrene appears to have the most difficult future, Bauman says. Even as demand for polystyrene rises at a bit more than 5% annually, capacity also will continue to rise, based on estimates of reports of construction plans. Overcapacity will exist throughout this decade. This overcapacity and noncompetitive costs of production in some areas of the world in contrast with other areas will lead to more shutdowns of polystyrene capacity during the decade.

Polyethylene of all kinds might just squeak through at the end of this decade in a balanced position in spite of some current problems in the marketplace that may continue through much of the 1980's, according to Bauman's current forecasts. Demand for low-density and linear low-density polyethylene will grow from about 10 million metric tons in 1980 to 16.4 million metric tons in 1990, at a rate averaging almost 5% per year. But at the same time, capacity will grow from 13 million metric tons to 20 million metric tons per year. This then means that in 1990 there will be about 2 million metric tons of excess capacity assuming an effective average operability of 90% of nameplate capacity.

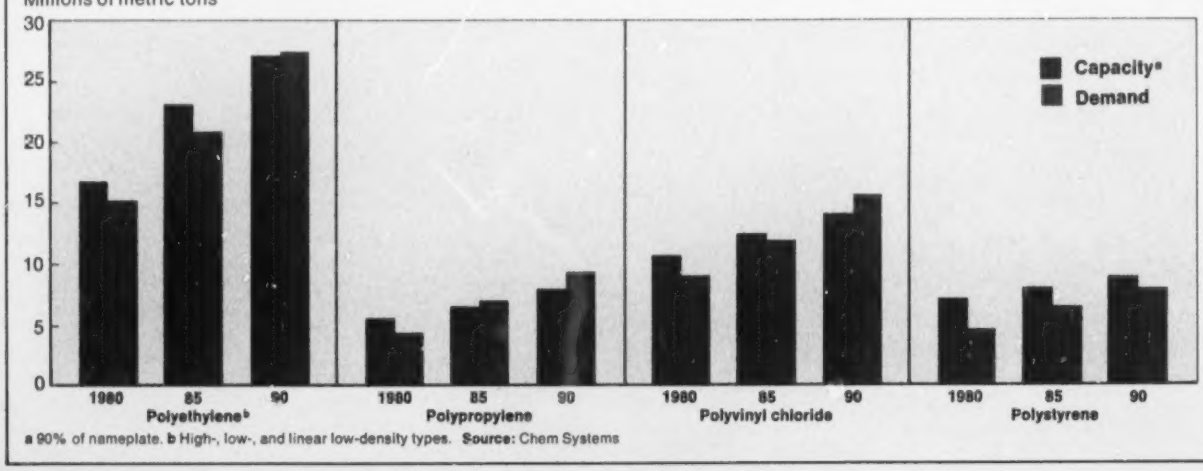
Much new capacity for low-density (mostly linear) polyethylene built in Canada, the Middle East, Asia, and South America will be in excess of their domestic demands. This resin can be expected to flow out of these

Normal alpha olefins will ride boom in polyolefins use

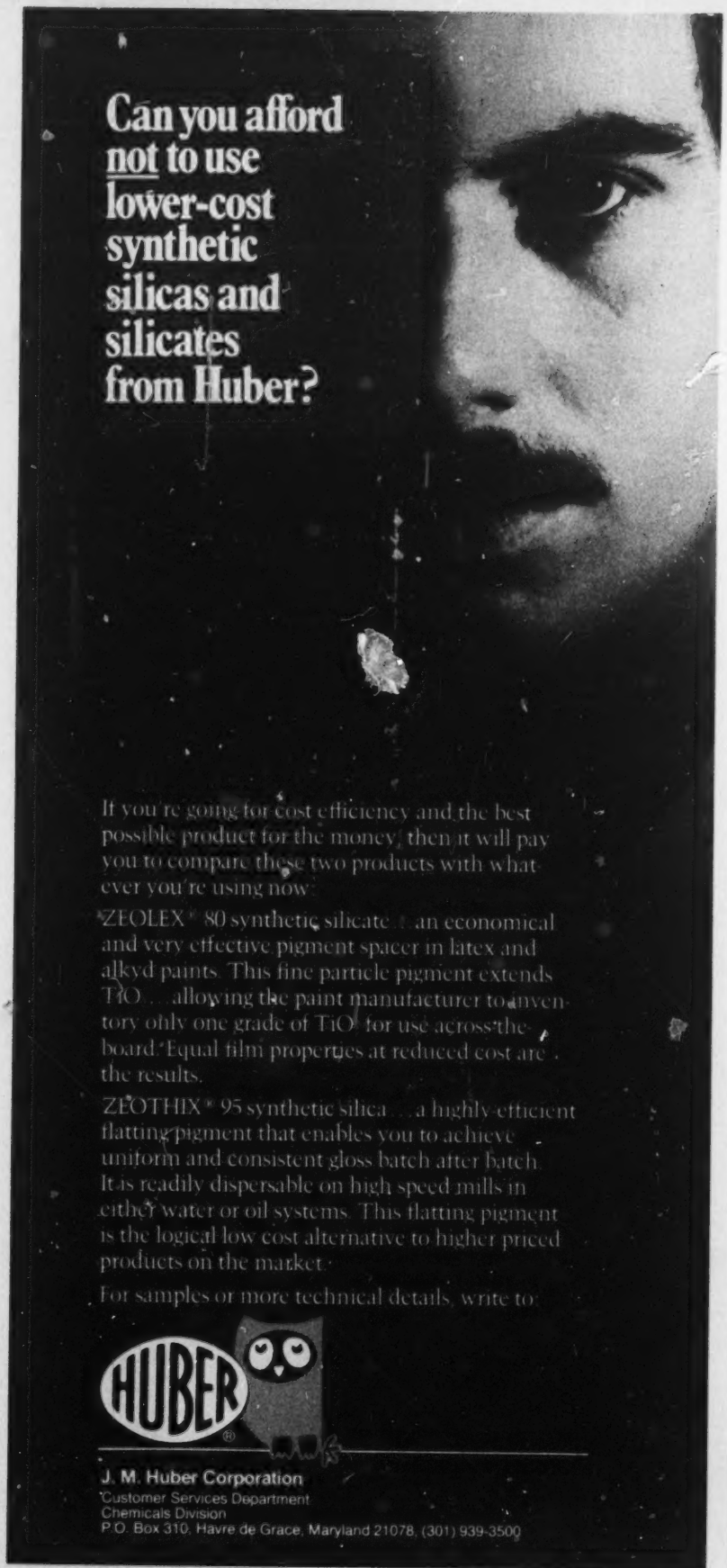
Millions of lb	Demand in North America			Average cumulative growth rate	
	1980	1985	1990	1980–85	1980–90
C_4	72	239	609	27%	24%
C_6	21	33	50	9	9
C_8	29	84	230	24	23
TOTAL	122	356	889	24%	22%

Source: Gulf Oil Chemicals

Global demand for major plastics may take until 1990 or later to catch up with capacity



a 90% of nameplate. b High-, low-, and linear low-density types. Source: Chem Systems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countries at prices lower than those of the traditional exporters, such as Western Europe, Japan, and the U.S.

Use of high-density polyethylene will grow at a faster rate during this decade—more than 8%—than low density, Bauman forecasts. This growth could cause demand to exceed capacity as early as 1985. But this is not likely because most producers either have or will have capability to make linear low-density in high-density plants and the reverse.

Therefore, Bauman points out, all of the various kinds of polyethylene must be considered. For this reason, polyethylene producers will do well to have a balance between supply and demand at the end of the 1980's. In short, he indicates that the outlook for the total polyethylene business through most of this decade is not very favorable.

Supply of polyvinyl chloride, now considered the resin in most trouble in the U.S., might become tight late in this decade. This presumes that new capacity additions in the world remain at low levels—2.9% annually over the decade and a demand growth of 5.8% annually. But during the first half of the 1980's overcapacity will be large.

The overcapacity problem could be heightened for some time, too, as the feedstock supply shifts from U.S.-made to imported ethylene dichloride, a result of changing energy and hydrocarbon costs in different parts of the world. Bauman suspects that ethylene dichloride could become one of the more widely traded commodities of the 1980's.

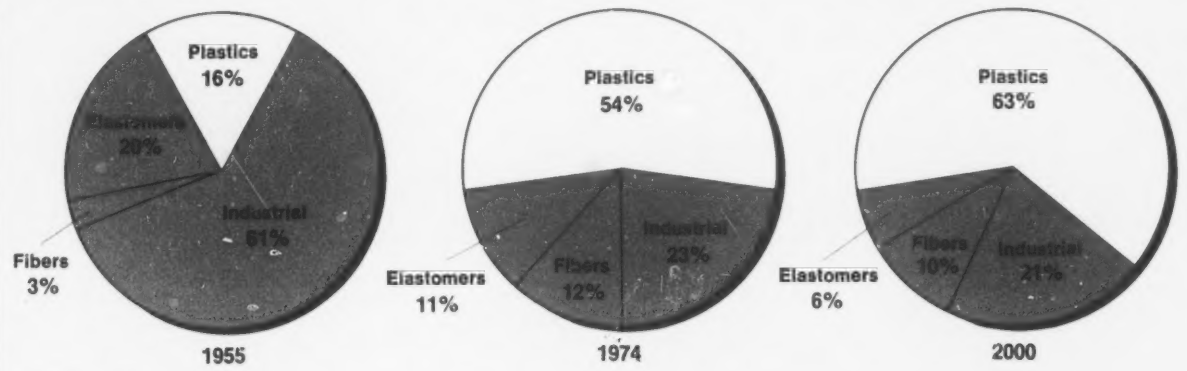
Turning to some specific areas of the world, Latin America's plastics industry will have a growth second only to that of the Middle East. Latin America's industrial plastics output likely will increase 250% over the next 10 years, according to Robert Albert of Dow Chemical. Most of the growth will be in the countries with oil and gas resources such as Mexico, Venezuela, Colombia, Brazil, and Argentina, with plastics industries in Ecuador, Peru, and possibly Guatemala developing late in this century.

By the year 2000, Latin American plastics output will be some 6 million metric tons or a fifth of production in developing countries of the world. Total production then should be almost 198 million metric tons.

Japan's plastics industry faces much the same problems as are faced in the U.S. and Europe, according to M. (Jack) Mizoguchi of Mitsubishi Rayon. Low-density polyethylene, for

Plastics' share of Latin American petrochemicals will continue to climb markedly

Petrochemical uses, %



Source: Dow Chemical Latin America

example, will have a low domestic demand growth of 1 to 2%, following a decline in production in 1980 from a peak of nearly 1.4 million metric tons in 1979. Higher crude prices forced up prices of low-density polyethylene, which restricted demand and prompted consumers to look for substitute materials.

The Japanese plastics industry currently is building plants for production of linear low-density polyethylene, according to Mizoguchi. He forecasts that linear low-density material will replace conventional high pressure-process, low-density polyethylene at a pace similar to that of the U.S. and Europe.

In other areas of polyethylene development, thinner films to reduce costs in packaging are coming. Technologists are working to develop higher strength grades, laminated films, and greater use of high-density polyethylene.

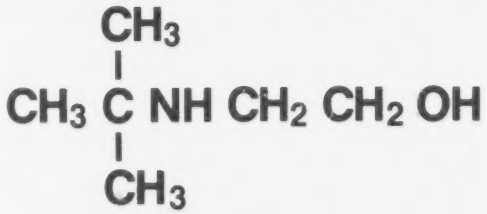
Raw materials for making plastics are not expected to be a problem during this decade, several speakers indicated. Supply of propylene might become tight temporarily, limiting polypropylene's growth.

Ethylene consumption in making polyethylene will continue to rise as a share of total consumption in the U.S., according to Arnold J. Cahill of Gulf Oil Chemicals. He puts the share to be consumed by polyethylenes at 49.4% of the total in 1985, up from 46.5% in 1981. By the 1985–86 period, U.S. ethylene capacity probably will be used at the maximum effective rate, assuming an improving inflation picture and stable energy prices.

One of the lesser known, but faster growing, uses of ethylene is in making the alpha olefins used as comonomers with various polyethylenes and polybutene-1. Demand for these olefins—1-butene, 1-hexene, and 1-octene—will grow an average of about 20% per year during this decade, Cahill says. Admittedly, the base is small, an estimated use of 122 million lb for all olefins in 1980 in North America, but consumption will reach nearly 900 million lb in 1990.

Besides polybutene, the linear low-density polyethylenes and high-density polyethylene are behind this growth. Union Carbide's linear low material uses 1-butene and Dow Chemical's 1-octene. Some film grades of these polyethylenes require as much as 19% of these comonomer alpha olefins. □

Try tertiary-Butylaminoethanol.



Another new alkyl alkanol amine from Pennwalt.

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WORLD CHEMICAL OUTLOOK

Gloom is pervasive among chemical producers throughout much of the industrialized world as 1981 draws to a close. Just about wherever you look, output of chemicals is being curtailed, plants are operating well below capacity, and return on investment is being squeezed under the twin impacts of recession-dampened demand and upward spiraling operating costs.

The U.S. chemical industry, which just a year ago was pulling itself out of a brief but painful slump, now finds itself sliding again into a period of disarray. Production has been unable to maintain any sustainable growth in the past two years. Industry executives are hopeful—but by no means certain—that next year's second half will bring relief.

Chemical firms in Western Europe, grappling with chronic excess capacity, weak prices, and heavy losses in many major product areas, are striving to adapt to the frigid business climate by drastically trimming and restructuring their operations. The chemical industry that emerges there in the next couple of years may be much changed from that in place during the 1970's. Meanwhile, growth has slowed in the state-controlled chemical industries of Eastern Europe and output frequently is falling short of targets.

Japan's chemical industry, too, is troubled by the high cost of feedstocks, a decline in vital exports, and stiffer competition from low-cost imports at a time when its home market is slack. And Canadian companies, likewise hard-pressed by a cost/price squeeze and dwindling demand at home, are pushing harder for exports, especially to sop up the output from the big petrochemical plants now under construction in gas-rich Alberta.

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Chemical output is sliding following a short-lived recovery

Although a new recession is forcing a cutback now, chemical producers hope for a strong rebound in 1982's second half

David M. Kiefer, C&EN Washington

That 1981 is going into the record as a recession year for the U.S. economy is really no surprise. A year ago, economic forecasters were contending that this year would witness several months of stagnation at best and that a mild decline in business activity was even more likely.

But that the year actually would be ending with the economy in the throes of a steep slump of still uncertain depth and duration definitely is not what the analysts were looking for. The standard scenario then was that business conditions during the first half of the year would be unsettled but that a strong rebound was in the cards during the second half. By the end of 1981, the seers avowed, industrial production would be rising smartly, unemployment would be shrinking, and the national economy in general would be more robust than at any time in the previous two years or more.

But it hasn't worked out that way—not by a long shot. As 1981 winds down, industrial production is being cut back drastically right across the board. New orders for manufactured goods plummeted 5% in October, for the third consecutive monthly decrease. Unemployment rose to 8.4% of the labor force in November, the highest level since 1975, and is expected to move to 9% or above during early 1982, which could push it higher than at any time since before World War II. And the consensus of economic forecasts points to a decline in real gross national product both during the current quarter and the first quarter of 1982, at least, following a very slim increase for 1981's third quarter.

In many ways, moreover, it's a peculiar recession that is now under way. For one thing, it follows hard on the heels of the 1980 recession; the business rebound of barely one-year duration from the trough of mid-1980 was the shortest such recovery of the postwar years. The recovery, in addition, was neither strong nor hardly ever complete. Industrial production, for example, never really worked its way above its pre-1980 peak before it started to ease off at the end of last summer. Unemployment never fell below an unsatisfactory 7% of the work force. The bellwether automobile and building industries remained deeply depressed throughout the recovery period. The current business dive, consequently, has taken off from a relatively low springboard.

Chemical producers, too, barely recovered from the 1980 decline in their operations. Production of chemicals and allied products (including drugs, detergents, coatings, and agricultural chemicals) climbed nearly 16% during the five months immediately following its recession low in July 1980, then remained practically unchanged throughout the first eight months of 1981 at about the same level it had been prior to the 1980 downturn. Output of chemicals and synthetic materials (plastics, man-made fibers, and synthetic rubber) alone increased 26% during the same five-month recovery period, but it, too, never moved appreciably above its prerecession peak at the start of 1980. In fact, the only group of basic chemicals that were being produced in significantly greater volume early this year than before last year's recession were fertilizer raw materials such as ammonia and other nitrogen products.

Then as industrial production as a whole began to falter at the end of last summer, output of chemicals also started to dwindle. Although it is still too early to track the decline quantitatively, C&EN estimates that production of chemicals and synthetics probably has fallen about 10 to 12% since last July and now is nearly 15% lower than it was 12 months ago. As a result, production for all of 1981 probably will surpass 1980's results only 3 to 5%, after having been 8% ahead of last year at the end of August.

How much further down the current slide has to run is by no means clear; turning points in a business cycle are notoriously difficult to foresee. Output of chemicals and synthetics fell 22% during the first half of last year. In the previous 1974–75 recession, the drop was almost 30%, also in just about half a year. Many economists now are convinced that the national economy will hit bottom during the first half of 1982—probably about the end of the first quarter. If that indeed should be the case, output of chemicals is likely to decline between 15 and 20%, pretty much mirroring what happened during 1980.

The key to recovery, of course, lies not so much with what happens in the chemical industry itself as with a return to health on the part of the major customers for chemicals in other hard-hit industries. Much of the blame for the current economic malaise rests on tight credit and the high cost of borrowed money during the past year or so, which in turn reflects government efforts to stem inflation. Soaring interest rates have clamped a lid on demand for major consumer purchases, most notably new homes and automobiles. And now the spreading recession has further sapped consumers' confidence, so that both these critical markets for such chemical materials as plastics, fibers, paint, and rubber are in greater disarray than ever.

Housing starts, for example, have been slumping all year and plunged

this fall to the lowest level in 15 years. Recovery is not yet in sight. Total housing starts this year probably will be no more than 1.1 million units, roughly 15% fewer than last year's disappointing 1.3 million units and barely half the number started in either 1977 or 1978.

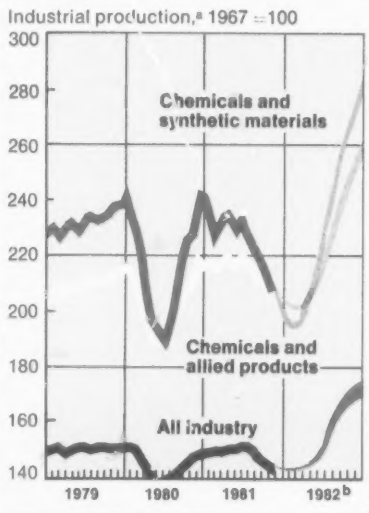
Although home mortgage rates, like other interest rates, have started to ease a bit in the past few weeks, housing experts don't expect them to fall to a manageable range of 14 to 15% much before midyear, if then. Consequently, demand for new housing is expected to remain soft well into 1982.

Conditions in the automobile industry now are no less dismal. The industry's high hopes for its 1982 models have gone aglimmering. (The 6.6 million cars built during the 1981 model year was the lowest number in six years.) Car sales sank in October and November to the lowest rate in 22 years. For all of 1981, auto sales probably will not quite match 1980's 8.9 million units, as high credit costs and high sticker prices take their toll. U.S. production, too, will lag 1980's 6.4 million units. With well over 200,000 auto workers laid off indefinitely, the auto industry, like the housing industry, is bucking two abysmal years back to back.

Detroit, moreover, is not looking for any meaningful recovery in the near future. Car makers have cut back their estimates for sales next year to between 9 million and 10 million units, with most forecasts bunched near the low end of that range.

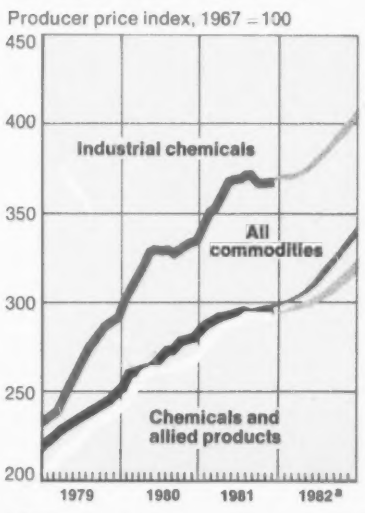
Although housing and autos are the most visible areas of weakness, in the past couple of months recession has spread much more widely through the U.S. economy. Low home sales and high credit costs have undercut the lumber industry and led to lower consumer demand for furniture, appliances, and other home furnishings. Weak demand for automobiles has forced cutbacks in steel and aluminum production. Output of aluminum, for example, has fallen about

Output will recover during next year's second half . . .



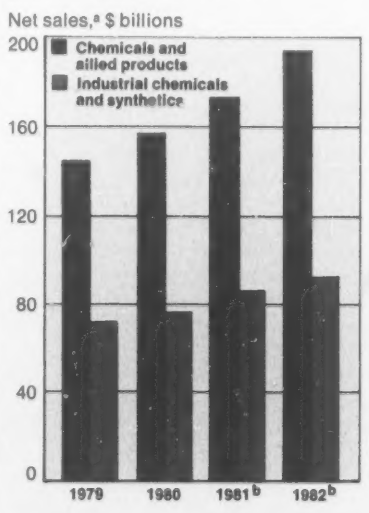
a Seasonally adjusted. b C&EN estimates.
Source: Federal Reserve Board

. . . spurring increases in selling prices again . . .



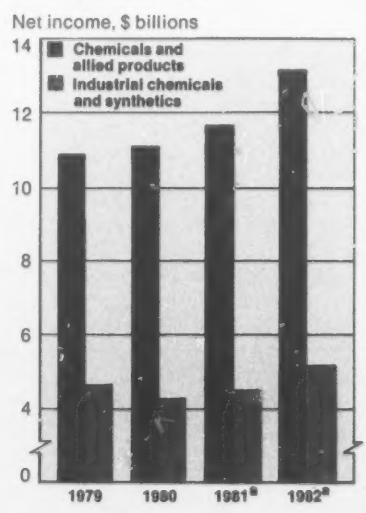
a C&EN estimates.
Source: Bureau of Labor Statistics

. . . boosting chemical producers' sales . . .



a Excludes sales of foreign subsidiaries. b C&EN estimates. **Source:** Federal Trade Commission

. . . and lifting their profits to a record level



a C&EN estimates.
Source: Federal Trade Commission

Modest growth ahead for production of chemicals after a standoff in 1981

	1982	1981	1980	1979
INORGANIC CHEMICALS Thousands of tons unless otherwise indicated				
Ammonia	19,600	19,200	19,044	18,523
Chlorine gas	11,200	10,700	11,190	12,228
Hydrochloric acid	2,700	2,500	2,752	3,090
Nitric acid	9,400	9,000	8,733	8,465
Oxygen, billions of cu ft	440	425	415	457
Phosphoric acid	11,000	10,300	10,856	10,317
Sodium hydroxide	11,400	10,900	11,311	12,772
Sulfuric acid	44,300	42,500	44,273	43,118
ORGANIC CHEMICALS Millions of lb unless otherwise indicated				
Acetic acid	2,850	2,750	2,977	3,265
Acetone	2,200	2,050	2,076	2,653
Acrylonitrile	2,050	1,900	1,830	2,018
Benzene, millions of gal	1,550	1,450	1,585	1,673
Butadiene	3,200	2,900	2,799	3,583
Cumene	3,750	3,600	3,459	3,917
Cyclohexane	1,950	1,875	1,964	2,425
Ethylene	30,500	28,500	28,667	29,904
Ethylene glycol	4,300	4,000	4,386	4,729
Formaldehyde	6,000	5,700	5,555	5,971
Methanol	8,500	8,000	7,153	7,367
Phenol	2,800	2,650	2,566	2,981
Phthalic anhydride	950	840	818	1,013
Propylene	14,900	14,100	13,657	14,198
Styrene	7,100	6,600	6,858	7,484
Toluene, millions of gal	1,050	930	1,017	1,010
o-Xylene	1,020	940	995	1,082
p-Xylene	4,400	4,050	4,238	4,650
PLASTICS Millions of lb				
Polyethylene, high density	4,950	4,600	4,405	5,010
Polyethylene, low density	8,000	7,600	7,291	7,793
Polypropylene	4,200	3,900	3,648	3,841
Polystyrene	3,900	3,600	3,521	4,005
Polyvinyl chloride	6,100	5,800	5,470	6,119
SYNTHETIC FIBERS Millions of lb				
Acrylic and modacrylic	740	690	779	761
Nylon	2,600	2,450	2,358	2,720
Olefin and vinyon	825	775	748	759
Polyester	4,350	4,200	3,989	4,178

Sources: Bureau of the Census, International Trade Commission, Society of the Plastics Industry, Textile Economics Bureau, C&EN estimates (for 1981 and 1982)

19% since last March and is likely to be 4% lower this year than in 1981. Bumper crops and slack demand, especially in export markets, have depressed prices for agricultural products and slashed farmers' income for the second year in a row to the lowest level since 1977. And next year is not expected to bring any marked relief. One result is a sharply curtailed demand for farm equipment.

All these developments spell deep trouble for the chemical industry in the next few months. Reduced farm income and weak demand abroad have cut into fertilizer sales, for one thing, with phosphate products especially hard hit. Production of phosphate products was down 20% from a year earlier for the four months through last October, and phosphate rock inventories have swelled to an all-time high.

Weakness in housing and automobiles has spilled over into plastics production, which has been trending downward since last March. Total output this year will be higher than in 1980, largely because the first half of 1981 came on strong. But output this year will not match that of 1979; output next year may not do so either. Increased capacity, meanwhile, has thwarted attempts by producers to hike selling prices into line with rising production costs.

After a relatively strong first half, synthetic fibers also are in a sharp slump. Shipments of man-made fibers were down 9% during the third quarter from the previous three-month period and have declined further since then. Production also was lower in the third quarter than during the second quarter and is being cut back further as the year ends. Industry executives look for reduced demand and low levels of output well into the first half of 1982.

Further aggravating the business climate for U.S. chemical producers is the poor state of business overseas. Western Europe's recession, coupled with the strength of the U.S. dollar, has curtailed demand for U.S. exports and eroded the profitability of foreign subsidiaries.

Even the typically recession-proof pharmaceutical sector of the U.S. chemical industry is taking its lumps this year. Profits are likely to be surprisingly lower than in 1980 for U.S. drug makers, in part because of currency exchange losses on operations abroad. However, the Financial Accounting Standards Board recently revised its rules for accounting for currency fluctuations so as, in effect, to isolate gains or losses from reported earnings. The new rules are likely to improve the financial results next year for both drug and chemical companies with a big stake in foreign countries.

If, as most economic prognosticators now predict, the current recession, no matter how sharp, is relatively brief, 1982 as a whole may not be a total loss for the chemical industry. Interest rates now seem to be declining, and after two or more years of slack sales for new homes, automobiles, and other big outlets for chemicals, a pent-up demand probably is waiting to be tapped. C&EN estimates, in fact, that business will start to pick up again for the chemical industry during next year's second quarter. By the end of next summer, production probably will be running at least as high as it was early this year and at year's end it could well be a third higher than it is now.

Prices, too, after weakness during the early part of 1982, probably will be strengthening again during the second half of the year. As a result, after a relatively dreary first half, both sales and profits are likely to be riding high as 1982 closes. Earnings for industrial chemical producers in 1982, for example, are expected by many industry analysts to top this year's mark perhaps 10 to 15%. □

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Growth slows dramatically for U.S. exports of chemicals

U.S. trade surplus in chemicals will shrink this year for the first time in nine years as overseas demand weakens

Earl V. Anderson, C&EN New York

The high-flying growth in world trade that everyone had become accustomed to during the 1970's and almost had come to take for granted is slowing down.

The Organization for Economic Cooperation & Development says so. The International Monetary Fund says so. The General Agreement on Tariffs & Trade says so. And businessmen who depend upon trade for their livelihood know that it's so.

In fact, world trade actually may decline this year. Not just in volume. Not just in constant dollars. But even in inflated dollars.

Last year, world trade (measured only as exports) became a $2 trillion economy in its own right. This year, it will be lucky—very lucky—to top that. More than likely, it will slide backward slightly to about $1.9 trillion. And that's in 1981 dollars.

It's no secret that the deep economic slump that is so widespread among industrialized countries is starting to put a strain on exporters. In developing countries, which are blossoming into increasingly important export markets for the developed nations, the situation is no better.

In the nonoil-producing developing nations especially, mounting costs of imported oil are raising havoc with international accounts. To compensate, they are cutting back on other imports, which means fewer exports for industrialized nations such as the U.S.

Other forces also are putting a crimp in world trade. Many countries have learned the hard lesson of energy conservation. This has kept the worldwide flow of oil lower than it otherwise would be and tends to keep the overall trade figures down.

But oil alone won't account for the trend. The United Nations' index of manufactured goods exports for the first half of 1981 shows no growth at all. The basic reason is the poor economic climate in most of the world. Not only has demand for imported products dropped, but free traders in good times become protectionists in bad times.

There's ample evidence that protectionism is on the rise, despite the accomplishments of the Tokyo round of multilateral trade negotiations.

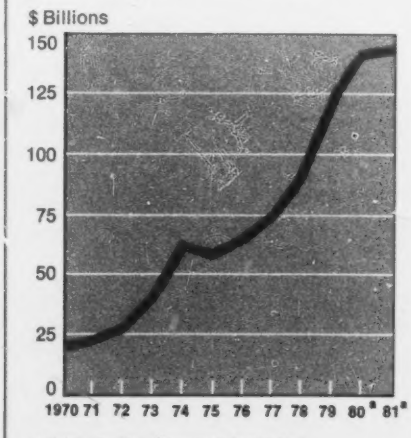
For the U.S. chemical industry, whose exports have enjoyed unprecedented growth during the past few years, the impact of all this is apparent. U.S. chemical exports this year probably will hit $21.2 billion—a remarkably high figure considering that exports of chemicals totaled less than $10 billion only five years ago.

Still, $21.2 billion represents only a 2.2% increase over last year, compared to the 20% and 37% increases of the previous two years. Obviously, the advantage in low-cost feedstocks that recently worked so well in their favor isn't helping U.S. chemical exporters overcome the handicaps of weak demand in overseas markets and a strong dollar that makes U.S. products more expensive overseas.

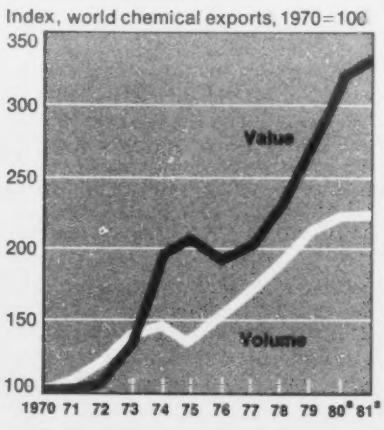
One notable exception is Japan, where mounting U.S. chemical exports are becoming a thorn in the side of troubled Japanese chemical companies. U.S. chemical exports to Japan will increase about 15% this year, to $2.3 billion and, in a reversal of roles, the Japanese are starting to complain about import competition. So much so that an industry-government team from Japan is scheduled to hold a series of meetings with their U.S. counterparts to discuss the problem.

The only other notable growth area for U.S. chemical exports this year will be Canada, which many U.S.

World chemical export growth looks dramatic...



...but the key is price, not volume



a C&EN estimates. **Source:** United Nations

companies consider a natural extension of their domestic market. Shipments to Canada should be up 17% in 1981 to $2.5 billion. But Canada is developing its own world-scale petrochemical industry based on inexpensive natural gas, primarily in Alberta, so that U.S. companies may not be able to rely on a sure-fire growth market there much longer.

In other major chemical export markets, it's been downhill all the way this year for U.S. chemical companies. Shipments to western Europe, as a single bloc the largest export market for U.S. chemicals, are off about 5%.

In developing countries, the situation is no better. These areas have become, collectively, an important outlet for U.S. chemicals and now account for about 40% of total chemical exports. But this year, exports to the two most critical areas, Latin America and Asia (excluding Japan), will be down 4% and 5%, respectively.

On the other side of the trade coin, U.S. imports of chemicals are growing faster this year—much faster than exports. One reason is that the U.S. economy throughout the early part of the year was in better shape than many European economies. That tends to encourage imports, although the impetus diminished during the latter part of the year. Another is that, just as a strong dollar makes exports more expensive, it makes imports less expensive.

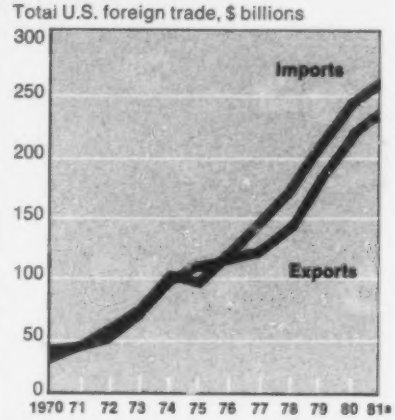
As a result, U.S. chemical imports are likely to jump almost 18% in 1981 to a record $9.6 billion. And the envied U.S. chemical trade surplus will drop from last year's $12.1 billion to $11.6 billion—the first drop in nine long years.

Do the discouraging events of 1981 signal the start of a long-term downtrend for the fortunes of U.S. chemical exports? Not necessarily.

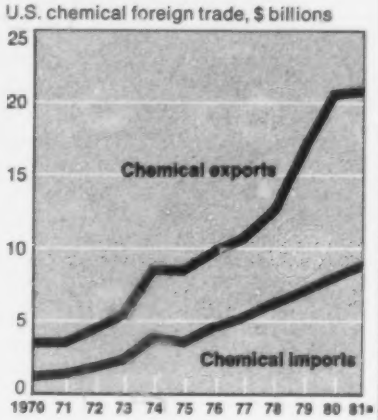
The industry can do nothing about economic conditions throughout the world, which in large measure dictate the flow of world trade. But there are other potential problems on the horizon:

- Competition is increasing from new chemical producers with low-cost feedstocks in Canada, Mexico, and the Middle East.
- There is growing government-owned competition on the chemical trade scene. Many foreign companies, either partly or entirely controlled by their governments, do business with a different objective in mind than that of private corporations. Often, these companies willingly sacrifice profits to achieve such goals as creating employment or even enhancing prestige.
- Protectionism is increasing. Although the last round of multilateral trade negotiations took the sting out of tariffs and supposedly slapped control on nontariff barriers, some countries still haven't put the agree-

U.S. trade deficit widens again...



...and chemical trade surplus shows a rare drop



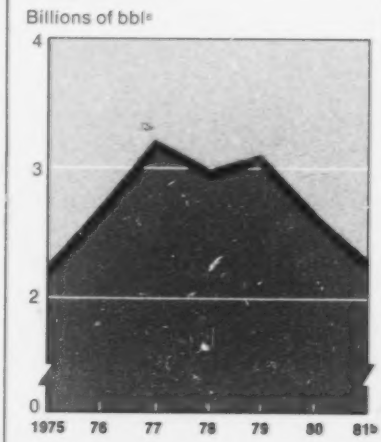
a C&EN estimates. Source: Bureau of the Census

Exports decline to some foreign markets for U.S. chemicals

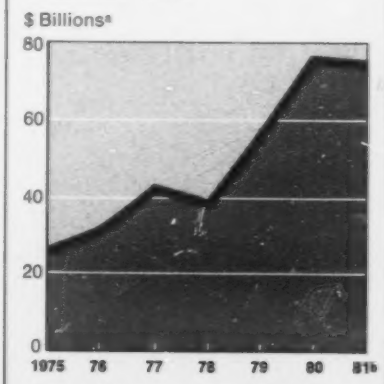
$ Millions	1981[a]	1980
U.S. CHEMICAL EXPORTS		
Canada	$ 2,502	$ 2,134
Western Europe	6,106	6,429
Eastern Europe	297	88
Japan	2,268	1,964
Communist Asia	360	386
Middle East	530	459
Rest of Asia	2,629	2,782
Latin America	4,643	4,846
Australasia	763	645
Africa	636	721
Other	466	286
TOTAL	$21,200	$20,740
U.S. CHEMICAL IMPORTS		
Canada	$2,986	$2,494
Western Europe	3,974	3,953
Eastern Europe	115	195
Japan	970	697
Communist Asia	125	107
Middle East	96	58
Rest of Asia	192	163
Latin America	691	536
Australasia	192	206
Africa	125	62
Other	134	112
TOTAL	$9,600	$8,583

a C&EN estimate. Source: Bureau of the Census

U.S. imports of oil are falling...



...but their cost remains high



a All petroleum products. b C&EN estimate. Source: Bureau of the Census

ments into practice. Protectionism also is being practiced in new, more sophisticated forms, under the guise of national economic policies.

These represent handicaps for U.S. chemical exports. But the industry has some aces up its sleeve.

The U.S. still remains the largest single integrated chemical market in the world. Because of that, U.S. chemical companies have been able to build large plants that have an inherent economy of scale.

U.S. chemical management is as good as any in the world. And the industry's strong technological base enables it to develop high-technology, higher value-added products.

This is important and will become more important as new competition neutralizes the industry's feedstock advantage. Chemical products flow from one country to another for a variety of reasons. But the fact that one country has a proprietary product that no other country has is one of the biggest. About one third of all chemical exports, according to Arthur D. Little Inc. estimates, involves technological trade.

Many chemical trade experts now are starting to discount, if not dismiss, the potential impact of new chemical-producing areas. It may be one thing for Middle East countries, for instance, to build huge plants to produce petrochemical products. It is another thing to market those products around the world.

Besides, producing commodity chemicals is only a first step in satisfying a chemical market. These new producing areas will need specialty processing chemicals and advanced downstream products. Consequently, if U.S. companies can improve their technological edge, they will more than compensate for any loss of their feedstock advantage.

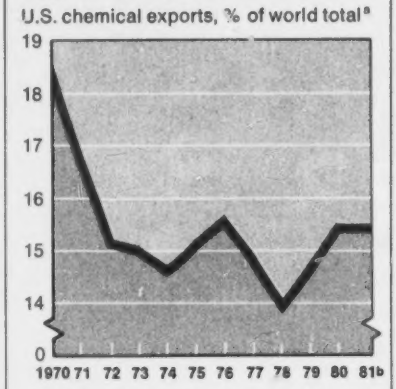
How this proves out in practice remains to be seen. Meanwhile, the U.S. industry's representatives in Washington are working more closely than ever with government trade officials to keep them abreast of the industry's concerns. The effort is justified, because, more than ever before, it is government action—or inaction—that dictates what happens in international trade.

The concerns are many. Enforcing multilateral trade agreements, especially the codes on subsidies and countervailing duties, is one key issue. Another is the apparent shift of emphasis from multilateral to bilateral trade negotiations. Another gigantic effort like the Tokyo round of trade talks, which lasted from 1973 to 1979, is unlikely soon. Yet, bilateral trade talks between the U.S. and other individual countries, although easier to digest, still require a lot of effort and input from industry.

The chemical industry also is concerned about the developing nations, many of which are exempt from some of the trade rules that govern industrialized nations. Their exports often receive preferential, duty-free access to the U.S. and other countries, and rightfully so. However, some developing countries, such as Mexico, Brazil, Taiwan, and South Korea, are more advanced than others and use the same advanced technology that is used in industrialized nations.

The problem is that there are no concrete guidelines that pinpoint when a country has advanced far enough that it no longer warrants preferential treatment.

U.S. share of chemical exports holds steady



a Defined as: U.S. exports as per cent of world chemical exports less U.S. imports. b C&EN estimates. **Sources:** United Nations, Bureau of the Census

Chemical industry leaders also will be watching closely to see what action the Administration may take against foreign investment policies of other nations. Concern about these policies, which may include local production content and export performance requirements, has been building quietly for some time. But it exploded recently as a result of Canada's curbs on foreign investment under its national energy program and its Foreign Investment Review Agency.

But Canada isn't the only offender in the eyes of U.S. trade officials. The list is getting longer and the U.S. soon may move against investment policies that have a distorting effect on trade. Because these policies may violate provisions of the General Agreement on Tariffs & Trade, the U.S. may challenge them in GATT. □

Plastics, fertilizers brake growth in U.S. chemical exports; imports generally are higher

	U.S. chemical exports				U.S. chemical imports			
$ Millions	1981[a]	1980	1979	1978	1981[a]	1980	1979	1978
Organic chemicals	$ 5,872	$ 5,697	$ 5,055	$ 3,369	$3100	$2539	$2159	$1734
Inorganic chemicals	2,205	2,106	2,712	1,207	1584	1323	1106	915
Radioactive materials	996	833	937	717	739	989	953	912
Dyeing, coloring, and tanning materials	191	186	177	145	221	194	185	171
Pigments, paints, and varnishes	339	304	273	241	96	89	76	63
Medicinals and pharmaceuticals	2,205	1,932	1,591	1,404	605	508	441	449
Flavors, perfumes, cosmetics, and toiletries	551	479	399	356	298	301	263	230
Cleaning and polishing materials	382	327	290	250	77	72	73	62
Fertilizers, manufactured	1,760	2,265	1,404	1,091	1190	1104	976	869
Explosives and pyrotechnics	85	87	62	65	67	59	58	43
Plastics and resins	3,858	3,884	3,241	2,088	778	646	626	518
Pesticides and disinfectants	572	553	516	445	288	263	190	159
Miscellaneous	2,184	2,087	1,649	1,240	557	496	379	303
TOTAL	$21,200	$20,740	$17,306	$12,618	$9600	$8583	$7485	$6427

a C&EN estimates. Source: Bureau of the Census

Chemical producers are slimming down to weather economic slump

Excess capacity, weak prices, severe losses in several product lines lead to a restructuring of a hard-beset industry

Dermot A. O'Sullivan, C&EN London

Restructuring for profit is the spirit that pervades chemical companies operating throughout Western Europe. All the majors—among them BP Chemicals, Dow, Du Pont, Essochem, Imperial Chemical Industries (ICI), Monsanto, Montedison, and Shell—are involved to varying degrees.

Changes in corporate structure, shedding of unprofitable business lines, staff trimming, and the like are not unusual, of course. But recognition of the necessity for such moves among the large European chemical firms is more widespread, and more acutely felt, than at any time in the recent past.

"There is pressing need to do something now," declares Walter Schäfer, who oversees developments in chemicals, plastics, and rubber thoughout the 10 countries of the European Economic Community at the Brussels headquarters of the Commission of the European Communities. "Companies must structurally solve the problem of oversupply. It's no good turning to governments or to the EC Commission for help. That would only prolong the period of adaptation and render the cost higher in the long run.

"The problem has existed since 1975," Schäfer continues. "Company executives have overestimated demand, and continued to invest in new capacity. They must now reduce it. So I believe 1982 will be the year of truth."

Reasons for restructuring are obvious. Most plants are running well below capacity. Prices are weak. Profit margins, where they exist, are slim. Indeed, sales in some product areas are being made at an outright loss.

Bulk thermoplastics are among the worst hit this year. Tom O. Hutchison, chairman of ICI's petrochemicals and plastics division, reckons that West European producers are losing about $200 million a month on sales of low- and high-density polyethylene, polypropylene, polyvinyl chloride, and polystyrene. BASF, headquartered in Ludwigshafen, West Germany, figures it has lost some $44 million on its commodity plastics business in this year's first nine months.

It was against this background that Montepolimeri, the plastics production and marketing arm of Italy's Montedison, recently decided to suspend sales of low-density polyethylene in Italy and elsewhere. The company's plants at Brindisi, Ferrara, and Priola have a combined annual production capability of 946 million lb. That's around 8% of Western Europe's total capacity of about 12 billion lb per year for the polymer.

Montepolimeri isn't alone in taking action on low-density polyethylene. BASF has shut permanently its 88 million lb-per-year plant at Antwerp, Belgium. And its joint venture with Deutsche Shell, Rheinische Olefinwerke at Wesseling, West Germany, has cut 352 million lb from its 1.5 billion lb annual capacity. These moves have cut BASF's low-density polyethylene capacity throughout Western Europe about a fifth. Others, like ATO Chimie and CdF Chimie in France and BP Chemicals, ICI, and Shell Chemicals, have taken similar action or are about to do so.

"Behavior in bulk polymers this year has been absolutely disastrous," comments John Harvey-Jones, ICI's chairman-elect, who takes over from Sir Maurice Hodgson next March. "However, I think there will be some improvement next year. There needs to be.

"Basically, it's very difficult to increase prices with vast overcapacities hanging over the market," he says. "But rates of loss like that [which we are seeing] do tend to concentrate the mind. At some stage, the losses eventually get so high that people either are quitting, or [they] decide they can't go on being silly, and start easing off volume and going for price."

Excess capacity extends beyond the thermoplastics. Annual West European demand for ethylene, for instance, is about 24 billion lb, against an installed effective capacity of more than 33 billion lb yearly, according to CEFIC (European Council of Chemical Manufacturers' Federations). "If nothing is done, this overcapacity will remain a thorn in our sides for the rest of the decade," comments Ton Grotens, who heads the petrochemicals and plastics division of DSM in the Netherlands.

Some ethylene units now are being mothballed. Nevertheless, Esso Chemical, Exxon's U.K. subsidiary, is moving ahead with its planned ethane cracker at Mossmorran, near Edinburgh, Scotland, after industry rumors earlier this year that it was reconsidering the project. When it starts up in 1985, it will have an ethylene output capability of 1.1 billion lb annually using ethane derived from North Sea gas. Shell Chemical, which is funding half the cost, will take half the output.

Not surprisingly, other ethylene

producers level criticism at the project. But Essochem and Shell Chemical stress that their situation is somewhat special because Esso and Shell are co-owners of the Brent oil field, some 280 miles out in the North Sea, from which the gas will come.

"Although I would not normally comment about a specific U.K. project, the crucial point about Mossmorran is that one must look at it in the context of a much wider envelope than just the chemical side of it," explains Richard Hobbs, head of public affairs for Shell International Chemical in London. "The economics of one part of what is a much more complex envelope is very difficult to show on its own."

Essochem feels strongly that efficiency is the key to remaining competitive in the market. Whereas a great deal of money would be needed to modernize existing older crackers, the Mossmorran unit will be the most modern and sophisticated of its type in Western Europe, the company points out. And it will use locally available, rather than imported, feedstock.

"Essochem plans to continue making improvements to its manufacturing operations," notes David R. Clair, who took over the presidency of the Brussels-based company this year. "We anticipate investing more than $100 million next year on projects that emphasize efficiency. In this way, we will improve profitability without having to rely on growth in demand."

DSM's Grotens observes that about a quarter of Western Europe's ethylene capacity is in plants that were built prior to 1968. "In my view," he says, "the problem of overcapacity can be solved only by an intensive cooperation among cracker operators. Maybe we should look at the possibility of crackers as pooled utilities. This would help eliminate the nonsensical practice of incremental costing, which we have experienced in the last two years, and favor the sensible business practice of integral costing." He proposes "a series of cooperative agreements and a more mature behavior in general, in order to secure an orderly conduct of our petrochemicals business."

Hobbs generally shares Grotens' view about the extent of overcapacity. "There is need to get rid of between 15 and 20% of capacity of the problem petrochemicals," he says. "The easy bit is shutting down a second production line, or a small cracker, or something of that sort. One can see one's way to reaching 10%. The next step will entail shutting down an entire plant site. It has got to happen. It's that final 10% that will really make the difference between feast and famine.

"Companies can do arms-length, commercial deals with one another within the ground rules of EEC with the object of making it attractive for one of them to close its plant permanently," he points out. "But it can't be restrictive. It must be a straightforward contract.

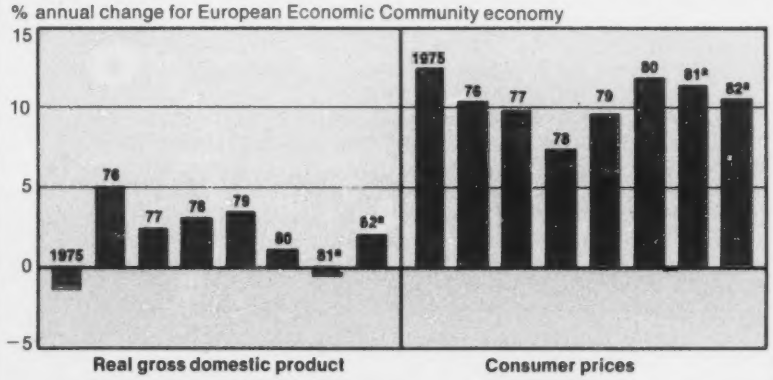
"We now are moving into the stage where companies will be fighting to be the survivors. Each will be trying to ensure that it will be the others who will shut down their sites."

It might have been thinking along this line that prompted Frank P. Popoff, president of Dow Chemical Europe, to make the somewhat startling prediction last May that "the number of [chemical] companies [worldwide] will be drastically reduced by [the year] 2000."

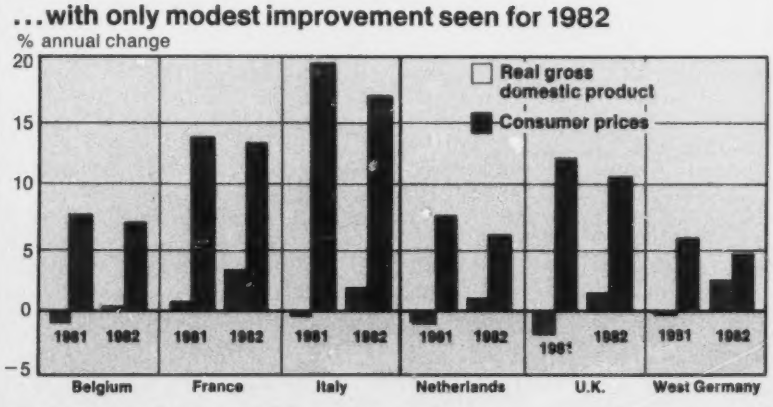
According to Popoff, today's top 13 West European chemical companies will shrink to six in the next 20 years. Which these six might be leads to some interesting speculation.

Petrochemical company executives who now are maneuvering to steer their enterprises toward a more profitable future can be heartened from the positive outcome of steps

Europe's economy remains weak and beset with inflation...

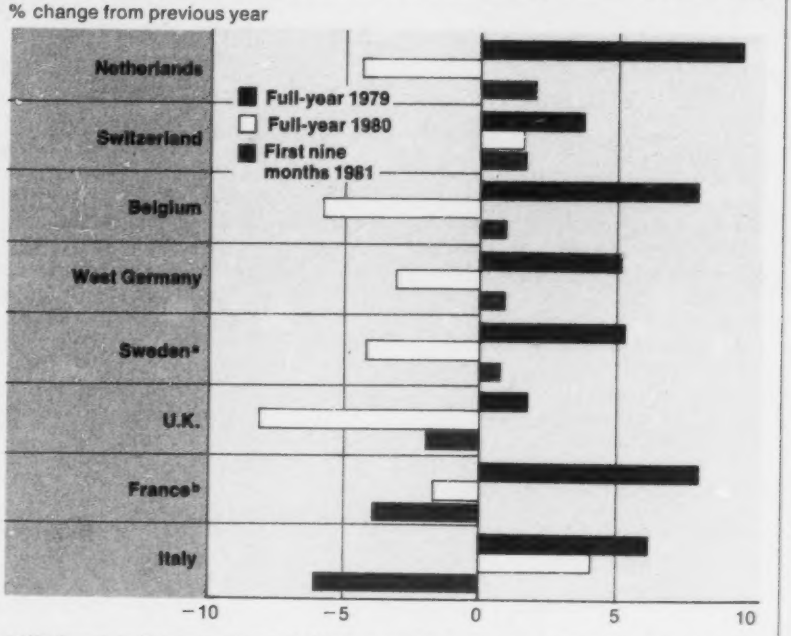


...with only modest improvement seen for 1982



ᵉ Estimated. **Source:** Commission of the European Communities

Chemical output shows little or no recovery from 1980 slump



a 1981 figure is for first six months only. b 1981 figure is estimate for full year. **Note:** Data exclude synthetic fibers. **Sources:** National chemical federations for each country

taken by the synthetic fiber and textile companies in Europe, which have undergone major structural changes during the past few years. And the moves appear to be paying off.

Courtaulds of the U.K., severely affected by the fibers and textiles downturn in recent years, showed an after-tax profit of nearly $20 million at the end of its first six months of business this year against a loss of about $5 million during the like period the previous year. ICI, too, might be emerging from its period of losses on fibers. "I'm optimistic that fibers will be right next year," Harvey-Jones believes. "The reason fibers are beginning to come right is because so many plants have gone out of production."

Courtaulds, for example, closed its nylon 6 plants in the U.K. this year. Monsanto stopped production of nylon 66 in Luxembourg and Scotland. And Du Pont is making moves to phase out polyester filament production at Uentrop, West Germany, although it will continue to make polyester staple and fiberfill there, as well as nylon 66 staple and carpet yarn.

Certainly, the job casualty rate in the European fibers business has been severe. All companies have been pushing through rationalization schemes. France's chemicals and fibers giant, Rhône-Poulenc, slated for government takeover under the nationalization program of the socialist government voted into power this year, has had a massive redundancy program under way in its fibers and textiles operations for the past several years. The original plan was to reduce the number of workers employed from 13,000 in 1977 to 4000 next year. But this is now thrown into some doubt under the new government's campaign against unemployment. Meanwhile, ICI has reduced its man-made fibers work force in Western Europe from 25,000 to the present level of 8600 during the past 10 years. "We are producing about the same amount now as we were then," Harvey-Jones remarks, "but the product mix is totally different."

Despite the upturn in European fibers business this year, the picture for the industry is far from rosy. As Mogens T. Andersen, textiles director for Europe and Africa at Monsanto's European headquarters in Brussels, points out, "Man-made fibers production in Western Europe is recovering in line with consumption, but it has not reached 1979 levels, the last good year in volume terms. Consumption in 1980 was 17% below 1979. This year, it is up only 10% from 1980. The prospects are for a continuation of the recovery in 1982, but at a slower pace, perhaps between 3 and 5%. On the other hand, while there has been a modicum of price improvement, costs continue to soar, and profit margins remain squeezed for all fibers."

The word from Du Pont's European base in Geneva, Switzerland, is that sales of industrial fibers are down this year, reflecting the weakness in various industrial sectors. Carpet fibers performed better, particularly bulk continuous filament yarn. The outlook for 1982 remains cloudy, although there are encouraging signs that the European recession is bottoming out.

The general state of the European economy obviously has a profound influence on all sectors of the chemical industry. This year's annual economic report of the Commission of the European Communities, published in October, opens with the somber statement: "It now seems likely that the volume of output will have been, at best, of the same order of magnitude in 1981 as in 1980, compared to the increase of 0.6% forecast a year ago. The recession lasted two quarters longer than expected.

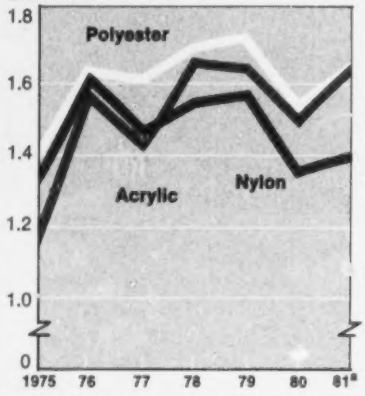
"There was no progress in reducing inflation. Consumer prices are forecast to grow considerably faster in 1981 than originally expected, 11.3% compared to 9.7%. The squeeze on household incomes resulted in a slight fall in the real level of private consumption compared to the 2% gain expected. Investment and stock-building performance also was weaker, influenced, no doubt, by the very high interest rates. The lower rate of [economic] activity, and the accelerating labor supply, has raised the level of unemployment [to] 7.8%."

Nor is the outlook for 1982 particularly encouraging. The overall inflation rate, on average, is expected to be 10.5%, led by Greece (22.5%), Italy (16.9%), and Ireland (16.0%). The unemployment rate is likely to move up to 8.5% of the EEC working population. Belgium (12.3%), the U.K. (11.3%), and Ireland (10.9%) will continue to be the worst affected.

EEC economists are looking for a 2% increase in net gross domestic product next year. Should this be realized, it will help the chemical industry, which generally outpaces the GDP rise by a so-called multiplier factor. If, as most chemical analysts expect, the factor is 1.5, chemical output across the board for EEC would advance 3% from this year.

Differences in the cost of electricity from one European country to another is a source of concern for

Fiber production remains below pre-1980 levels



a Estimates. **Source:** CIRFS (International Rayon & Synthetic Fibers Committee)

chemical producers in high-cost locations, such as the Netherlands and the U.K. The anguish is felt most keenly by those engaged in the electrolysis of brine, where electricity accounts for some 80% of chlorine's variable production cost. This feeds through to vinyl chloride and polyvinyl chloride.

"At the present time, the average cost of electricity for this operation in the U.K. is approximately 80% higher than it is for comparable operations in West Germany where ICI also manufactures chlorine," complains ICI's Harvey-Jones. "Even allowing for pound sterling-deutsche mark parity shifts, I'm still paying nearly twice as much for electricity in the U.K.

"We've got the most modern chlorine technology anywhere, brand new plants, and a host of very sophisticated ways of putting added value onto chlorine. But in a case like polyvinyl chloride, we can't compete [from the U.K.]; we lose money. This past year, profitability of our U.K. Mond division [maker of heavy industrial chemicals such as chlorine] has roughly halved, very largely due to high electricity costs."

The most positive development of 1981 for European chemical industry managers is that oil and naphtha prices remained stable. The contract price for naphtha in the first quarter was $358 a metric ton. During this final quarter, it is about 5% less at $340.

But the price in U.S. dollars is only part of the picture. Some very strong West European currency movements against the dollar throughout the year were superimposed on this. "Frankly, it has screwed up the whole picture," bluntly comments Shell International Chemical's Hobbs.

During last year's first half, for instance, the West German deutsche mark remained reasonably stable against the dollar, but since then it lost ground steadily until, by last August, the dollar was worth 45% more than in January 1980. This meant, of course, that West German chemical concerns were paying 45% more for naphtha feedstock in local currency than they were 18 months earlier.

Since August, the dollar has weakened slightly against the deutsche mark, but it still remains relatively strong. The Netherlands has faced the same situation because of the close parity "tie" between the guilder and the deutsche mark.

The pattern of the U.K. pound sterling was somewhat different. It remained strong against the dollar for most of 1980. Last March, it began to weaken and, by September, the dollar had gained in strength almost 33% from last January.

Much the same situation prevailed throughout EEC and the rest of Europe. The EC Commission states in its annual review that "the most conspicuous contributing factor to the differences between the forecast and out-turn [of the EEC economy this year] had been the strong appreciation of the U.S. dollar and the related rise in worldwide interest rates. The 34% increase of the dollar against the ECU that has occurred in the 12 months to September 1981 was very much greater than expected." The ECU, the European currency unit, is the EEC monetary unit based on a weighted "basket" of member countries' national currencies.

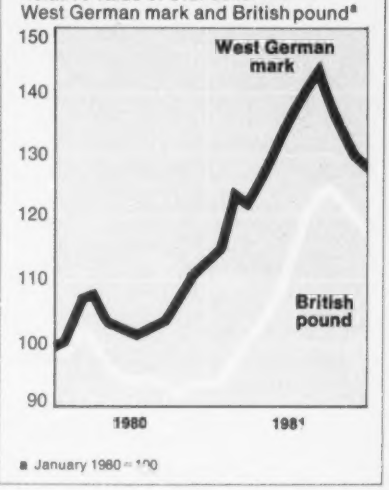
European businessmen, on the other hand, tend to have a split opinion when it comes to evaluating the effect of parity changes on their trade dealings. When their national currencies are weak in relation to the dollar, it hurts when they must buy goods that bear a dollar price tag. But the reverse holds true when it comes to selling their products to dollar-zone countries. And since more than half of world trade is invoiced in dollars, the potential for boosting exports is increased. Throughout Europe, however, chemical products are priced largely in deutsche marks.

No doubt it was this factor that helped Hoechst A.G., the parent company of the worldwide concern headquartered in Frankfurt, West Germany, to advance its export sales 14% between January and September this year compared to the like period in 1980. "In export business," Hoechst management says, "sales volume rose around 7% over the first nine months of 1980. Satisfactory increases were registered by fibers, plastic film, technical information systems, and pharmaceuticals." BASF and Bayer, the other West German chemical giants, likewise posted gains in export markets.

Europe also gained when the strong dollar led to slackening of imports of chemicals from the U.S. Polypropylene imports dropped 57% during this year's first nine months, compared to the like 1980 period. Low-density polyethylene imports were off 53%. There was a noticeable easing, too, of shipments of fibers and other U.S. chemical products to Europe, many of which were subject to dumping complaints a year ago. □

U.S. dollar has been strong in Europe this year

Relative value of U.S. dollar vs. West German mark and British pound[a]



a January 1980 = 100

Europe's petrochemical industry is operating well below capacity

Billions of lb	Total effective capacity	West European market[a]	Average plant capacity utilization %
Ethylene	33.31	24.20	73%
Ethylene oxide and derivatives[b]	1.78	1.19	67
Nylon fiber intermediates	3.87	2.41	62
Polyethylene, high density	4.95	3.30	67
Polyethylene, low density	11.88	9.33	79
Polypropylene	4.09	3.05	75
Polystyrene	5.85	3.70	63
Polyvinyl chloride	10.70	8.65	81

a Includes net exports from West Europe. b Based on ethylene oxide equivalent. **Source:** Imperial Chemical Industries

Japan

Troubled petrochemical makers seek help in staunching imports

With costs up, exports falling, and domestic demand slow, chemical industry may face structural reforms

Earl V. Anderson, C&EN New York

Japan is in trouble again—or still—because it is doing so well at what it does better than most other countries: exporting. The U.S. and several European countries are putting a lot of muscle on Japan to cut back exports and to open wider its wealthy domestic market to imports.

Japan's petrochemical industry also is in trouble. And a series of meetings have been scheduled in Washington this month and early next year between government and industry representatives of both countries to discuss one of the industry's biggest headaches. That headache is, ironically, the increasingly large barrage of petrochemicals that U.S. companies are exporting to Japan.

There is no doubt that the volume of petrochemicals from the U.S. has been increasing dramatically in Japan. Additional petrochemicals have been coming in from Canada. These imports are certain to increase.

Although this flood of imported petrochemicals is, indeed, a problem for Japan's chemical industry, it

Japanese chemical production is down almost across the board

Thousands of metric tons unless otherwise indicated	1980	Seven months 1981	Seven months 1980	% change
INORGANIC CHEMICALS				
Ammonium chloride	683	340	436	−22%
Ammonium sulfate	1879	1059	1129	−6
Calcium carbide	550	301	342	−12
Calcium superphosphate	591	289	386	−25
Carbon black	575	330	334	−1
Chlorine, liquid	763	443	466	−5
Hydrochloric acid	570	331	328	1
Nitrogen[a]	4586	2995	2650	13
Oxygen[a]	6854	3787	4107	−8
Sodium carbonate	1357	696	828	−16
Sodium hydroxide	3159	1677	1930	−13
Sodium silicate	712	412	409	1
Sulfuric acid	6777	3803	4023	−5
Titanium dioxide	173	101	108	−6
ORGANIC CHEMICALS				
Acetaldehyde	432	186	290	−36
Acetic acid	418	205	258	−21
Acetone	235	123	150	−18
Acrylonitrile	469	281	290	−3
Benzene	2060	1120	1315	−15
Butadiene	574	306	369	−17
Butanol	222	133	142	−6
Caprolactam	443	252	263	−4
Cyclohexane	500	268	297	−10
Dioctylphthalate	241	131	155	−15%
Ethylene	4176	2180	2703	−19
Ethylene dichloride	2060	1018	1313	−22
Ethylene glycol	492	211	308	−31
Ethylene oxide	529	256	333	−23
Methanol	836	447	558	−20
Octanol, synthetic	241	137	152	−10
Phenol	215	119	128	−7
Phthalic anhydride	235	149	152	−2
Propylene	2636	1435	1668	−14
Propylene glycol	163	96	97	−1
Styrene	1114	632	740	−15
Terephthalic acid	601	345	360	−4
Toluene	889	486	564	−14
Toluene diisocyanate	67	33	39	−15
Xylene	1195	688	752	−9
Urea	1770	911	1126	−19
PLASTICS				
Phenolic resins	304	169	185	−9
Polyethylene	1860	1022	1210	−16
Polypropylene	927	552	586	−6
Polystyrene	1129	665	738	−10
Polyvinyl chloride	1429	698	911	−23
SYNTHETIC RUBBER	1094	598	684	−13

[a] Millions of cubic meters. **Source:** Ministry of International Trade & Industry

really is a symptom of a far deeper problem. Japanese refer to it as a "structural" problem. But what it boils down to is that the petrochemical industry, choking on expensive naphtha feedstock (much of it imported), has too many companies with too much capacity cranking out products that are too expensive for a domestic market that is too small.

Exports, traditionally the outlet that is supposed to take up the slack, are becoming increasingly less capable of performing that function. The same competitive edge that is enabling U.S. and Canadian companies to export petrochemicals to Japan is also enabling them to squeeze Japanese petrochemicals out of Japan's all-important export markets in Southeast Asia.

As a result, Japan's chemical exports will decrease this year for the first time since 1976. Its chemical trade surplus will go down for the third successive year. This year's estimated $540 million chemical trade surplus is but a shadow of the $1.8 billion that it was in 1975.

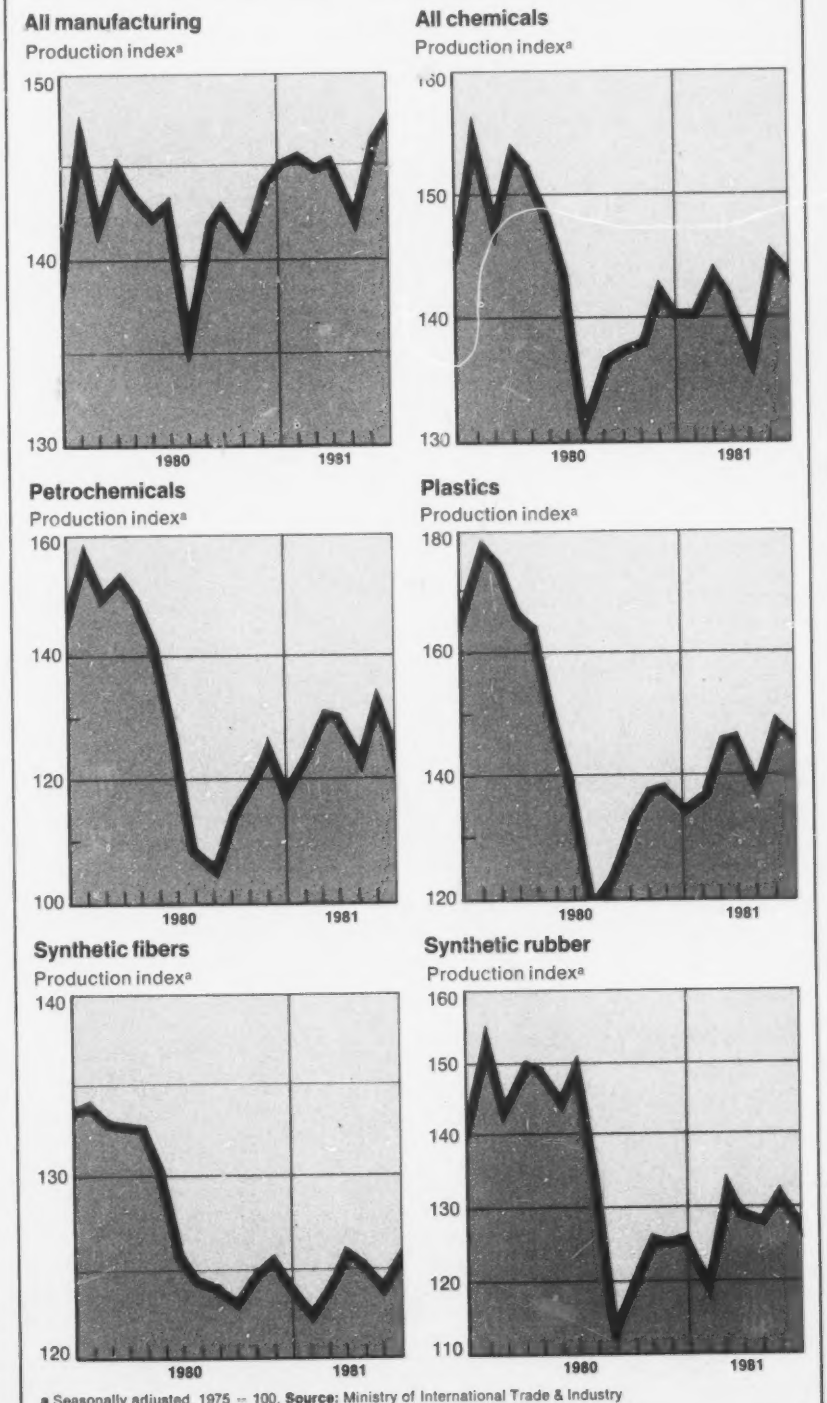
On the Japanese home front, chemical demand has been, to put it mildly, a nightmare. Take a look at chemical production this year. Only two major chemicals (hydrochloric acid and sodium silicate) show any growth through the first seven months. And that's only 1% for each. All the rest are wearing minus signs– some of them very flashy minus signs.

What is happening to ethylene in Japan pretty well typifies the problems plaguing the industry. Recent data indicate that Japan's ethylene output will be about 3.64 million metric tons this year, down 13%, instead of the 19% loss it experienced through the first seven months.

Nevertheless, this will be the first time that ethylene production has fallen below 4 million metric tons in Japan since 1977 and output will be the lowest since 1975. Producers, with a combined capacity of 6.2 million metric tons, are operating at a paltry 58% of capacity.

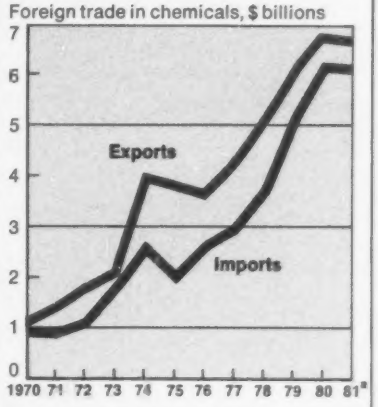
How will Japan handle its dichotomous problems? Again ironically, solving its overall trade problems with the U.S. and Europe may prove to be easier than solving its petrochemical dilemma. Responding to pressure

Chemical output remains under year-ago levels



a Seasonally adjusted, 1975 = 100. **Source:** Ministry of International Trade & Industry

Japan's chemical trade balance is narrowing



a C&EN estimates. **Source:** Ministry of International Trade & Industry

from its trading partners, Japan already is taking steps to curb exports and to increase imports.

Meanwhile, a steadily strengthening yen may act as a natural brake on Japanese exports. The yen, partly in response to falling interest rates in the U.S., has been rebounding lately. In late November, the exchange rate was 226 yen to the dollar. It has been gaining ground since then and experts think that the rate will hit between 200 and 210 yen to the dollar by the end of the year.

A stronger yen, of course, makes Japanese exports more expensive. Demand for them in overseas markets should drop.

That's fine for Japan's international political-economic problems. But curbing chemical exports will hurt, not help, its ailing chemical industry.

It's risky to predict what will come out of the proposed petrochemical trade talks with the U.S. But it's not too risky to speculate that, if the results don't satisfy Japan's Ministry of International Trade & Industry, the agency may consider taking some tough, unilateral steps. These could include quotas, higher tariffs, or even an import surcharge such as the European Economic Community imposed on U.S. chemical exports during the past few years.

Japan attributes the U.S. petrochemical export advantage to lower feedstock costs, particularly those based on regulated natural gas. If natural gas prices are deregulated, U.S. companies will lose some of that advantage vis-a-vis Japan. But not a whole lot.

The Fuji Bank estimates that the difference in Japanese and U.S. ethylene prices will shrink from 40% in 1980 to about 20% in 1990. That's a long way off.

Obviously, Japan has to do something about its petrochemical import problem. That's important. But many chemical experts there think that restructuring the industry is crucial. Leaders in both government and industry are working on it. But it won't be easy.

Some steps already have been taken, however. Imports, along with excess capacity and weak markets, prompted Japan's polyvinyl chloride industry to form an antirecession cartel six months ago. That cartel was extended last month because demand had not increased and inventory adjustment wasn't adequate. In the coming months, cartel members must hold production to 109% of the September-October monthly average.

Now, a proposal has been made to mold the 17 polyvinyl chloride producers into four joint sales companies. This, according to Hiroshi Takahashi, president of the Japanese PVC Association, should help to reduce competition.

What is happening in PVC may be a precursor to what eventually will happen to the entire petrochemical industry. In an interim report to the government, the Industrial Structure Council suggests that the industry reduce the number of manufacturers through mergers, thus eliminating excessive competition.

It also urges the government to take steps to ease the industry's feedstock problems. Among them: Continue the tax exemption on imported naphtha, consider exempting domestically produced naphtha from taxes, and improve the nation's naphtha importing procedures, perhaps through a joint importing company.

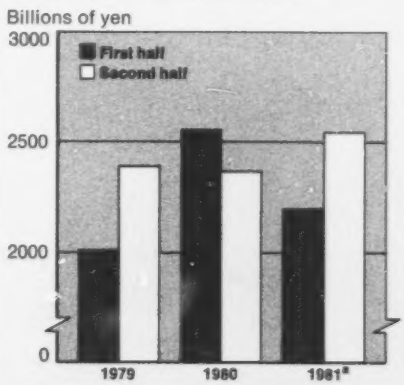
With or without structural reform, Japanese chemical companies are hoping that the domestic market picks up soon so that they can get some relief from their present troubles.

Responding to a recent questionnaire sent out by the Japan Chemical Industry Association, most chemical companies rated their third quarter business from "bad" to "very bad."

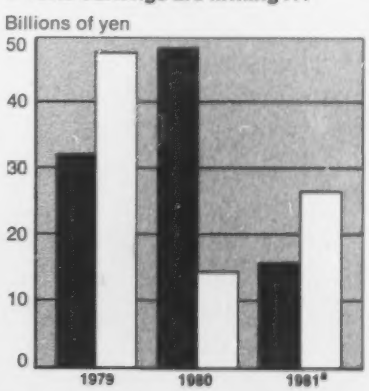
The consensus is, however, that fourth-quarter results will show some improvement. But a significant gain for the chemical industry may have to wait until next year. □

Petrochemical firms, sweating out a poor year, look for second-half relief

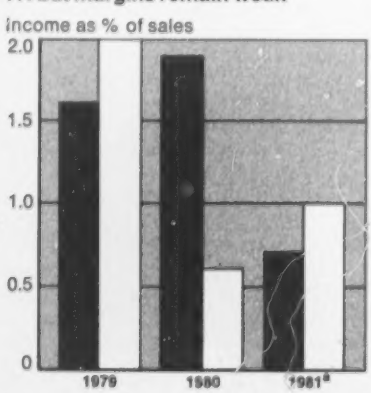
Sales inch toward earlier peak . . .



. . . and earnings are firming . . .



. . . but margins remain weak



a Estimated. **Note:** Data for fiscal years ending March 31. Based on results of 10 leading Japanese petrochemical companies: Mitsubishi Chemical Industries, Sumitomo Chemical, Asahi Chemical Industry, Toray Industries, Mitsui Toatsu Chemicals, Teijin, Showa Denko, Mitsubishi Petrochemical, Dainippon Ink & Chemicals, and Mitsui Chemical. **Source:** Toyo Keizai Shinposha

Cost/price squeeze burdens chemical firms in Canada

Flourishing recently, exports will have to become even more important as big petrochemical expansions come on stream

Earl V. Anderson, C&EN New York

Along with all Canadians, Canadian chemical producers have watched the bitter struggle between the federal government and the provinces over repatriating, or "bringing home," Canada's constitution from the British Parliament.

Because petrochemical feedstocks are so important to the industry's future, they have watched with more interest than most the equally bitter fight between Ottawa and Alberta over energy pricing and revenue sharing. The complicated agreement that ended the dispute raises the prices of domestically produced oil and natural gas, although it keeps those prices below world market levels. It came in September only after Alberta unilaterally cut back its oil production to protest federal policies. Although it was better than no agreement at all for the chemical industry, not all chemical companies are satisfied with it.

On the economic front, the chemical industry's hopes early in 1981 for recovery faded into later disappointment. The winds of a recession in Canada, which everyone knew was coming as a result of tight monetary policies and high interest rates, started blowing in earnest during the third quarter. Now it appears that the recession is going to be deeper and longer than anyone expected.

The new federal budget, recently introduced by Finance Minister Allan MacEachen, was a disappointment to those who were hoping for economic stimulus. Admittedly designed to reduce interest rates and inflation, the budget won't do much to spur a lagging economy, according to many Canadian economists who see it as the wrong medicine for Canada's present economic ills. As a result, they are adjusting their forecasts of economic growth in 1982 downward. Earlier projections, which had 1982 real growth in gross national product ranging from 2.5 to 3.5%, now have been revised to about 1.5% or lower—perhaps much lower.

If these economists are right, it will be some time before Canadian chemical companies return to bottom-line respectability. It now appears all but certain that for the chemical industry, business during most of next year will resemble this year's second half.

It was in the second half of 1981 that the industry's profit picture started falling apart. Production volume was not the problem. With the exception of a few heavy inorganic chemicals, such as sulfuric acid, phosphoric acid, and ammonium phosphate, output of most important chemicals increased in 1981, if only marginally.

Some products scored significant increases. Ethylene, for instance, will be up about 12% this year and plastics production remains strong. Output of high-density polyethylene, for example, probably will rise 14%.

What, then, is the problem? For most Canadian chemical companies, it is a classic cost-price squeeze. Although chemical selling prices are rising in Canada, they are not rising so rapidly as feedstock costs, particularly for petrochemicals.

Tough competition in a small domestic market among Canadian companies and against imports makes it difficult for producers to raise prices enough to cover increased feedstock costs. The same is true in export markets, where competition

Production of chemicals will grow only modestly in 1981

Thousands of metric tons	1977	1978	1979	1980	1981[a]
Ammonia	2162	2398	2405	2565	2650
Ammonium nitrate	925	871	914	873	900
Ammonium phosphate	1147	1178	1336	1466	1395
Benzene	383	555	492	604	625
Chlorine	888	941	1031	1303	1295
Ethylene	567	826	1014	1184	1330
Hydrochloric acid, 100%	136	155	154	177	185
Phosphoric acid, 100% P_2O_5	556	554	748	808	750
Polyethylene, high density	345	478	200	202	230
Polyethylene, low density			428	439	475
Polystyrene	91	99	124	110	125
Polyvinyl chloride	100	125	145	190	230
Sodium chlorate	162	199	224	245	300
Sodium hydroxide	1014	1036	1138	1459	1460
Sulfuric acid	3140	3261	3666	4295	4060
Urea	805	1217	1212	1274	1425

[a] C&EN estimates. Source: Statistics Canada

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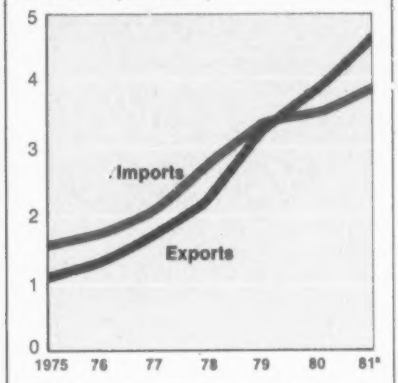
Chemical trade moves more strongly into black



a C&EN estimates. **Source:** Statistics Canada

throughout the world is intensifying.

The result is becoming apparent in chemical company financial statements. Using the combined results of four top Canadian chemical companies (C-I-L Inc., Celanese Canada, Du Pont Canada, and Union Carbide Canada) as a guide, it becomes painfully clear what the industry may be up against for most of next year.

In the happier days of 1981's second quarter, the combined sales and earnings of these four companies increased 15% above the first quarter. Profit margins also increased slightly. In the third quarter, however, sales were off 17% and earnings dropped a hefty 50%.

Things might have been worse had it not been for exports. Despite increased competition, Canada's chemical exports are flourishing. As a result, the long-standing deficit in the country's balance of chemical trade swung into an $88 million (Canadian dollars) surplus in 1979. This year, a 17.5% increase in chemical exports (to $4.7 billion) will raise the chemical trade surplus to $900 million.

How chemical exports will fare next year remains to be seen. Fertilizer and organic chemicals are the two leading Canadian chemical exports, accounting for more than half of the total. One problem is that more than half of Canada's total exports are shipped to the U.S., which faces an economic slump of its own. This could put a crimp in the growth of Canada's chemical exports, and the industry's concerted effort to crack Far East chemical markets may not be able to take up the slack.

One thing is certain. The world-scale petrochemical plants being built in gas-rich Alberta, and to a lesser extent in British Columbia, are geared to the export market. Companies building them will push export sales as hard as possible.

The Canadian petrochemical buildup is awesome. According to a recent count, 10 major petrochemical projects have been approved and are being built in western Canada, at a combined capital cost of $2.4 billion. All but one (Ocelot's methanol unit in British Columbia) are going up in Alberta.

Alberta's second major ethylene plant is expected to be on stream by 1984 and a third unit has just been approved. Plans already are under way for a fourth ethylene plant, which probably will come on stream around 1987.

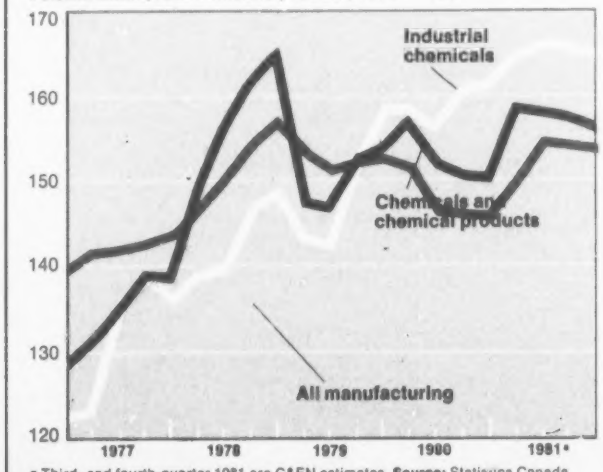
There is little doubt that these plants will be needed. In addition to the 10 projects approved and under construction, an additional dozen projects are being planned and are in the approval mill. Most of these units will produce ethylene derivatives; all but one will be built in Alberta. Together, they will add another $5.2 billion to Canada's petrochemical investment.

Even if some of these projects are scrapped, it's obvious that Canada will become a petrochemical force to reckon with. Installed ethylene capacity alone is expected to hit 2.85 million metric tons a year by 1987.

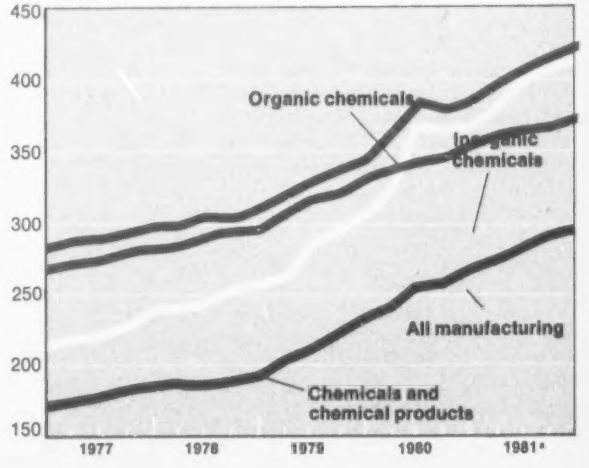
The outlook isn't that rosy for producers in eastern Canada. Not only will they have to contend with new competition from the West, but they will have to rely on more expensive, oil-based feedstock. Union Carbide's recent decision to defer expansion of its polyethylene plant at Sarnia, Ont., may be a harbinger of the problems eastern producers will be facing.

Originally, Canada's National Energy Program stipulated that oil prices would not rise above 85% of world prices. The September agreement between Ottawa and Alberta changed that. The blended price (of conventional old oil and new oil) at the refinery gate now can exceed 85% of world prices. And changes in natural gas pricing also tend to increase the advantage for natural gas-based petrochemical producers. □

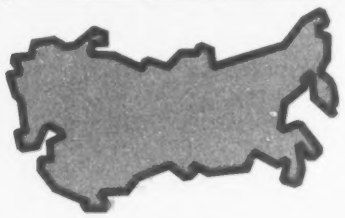
Chemical output peaked early this year ...



... but prices are rising sharply



a Third- and fourth-quarter 1981 are C&EN estimates. **Source:** Statistics Canada



Output is falling short of targets in Eastern Europe

Despite slowing growth chemicals continue to rate high priority in economic plans of Soviet Union and its allies

Richard J. Seltzer, C&EN Washington

This month, the Soviet Union and its six East European allies in the Council for Mutual Economic Assistance (CMEA)—Bulgaria, Czechoslovakia, East Germany, Hungary, Poland, and Romania—complete the first year of their new five-year plans (1981–85). The chemical industry receives high priority in these development plans, and it is continuing to make considerable progress. However, as with many economic and industrial sectors, chemical operations in CMEA countries generally are falling short of national targets.

The problems are many: shortages of raw materials, labor, and energy; construction and transportation bottlenecks; low productivity; poor product quality; wasteful use of resources; inefficient industrial management; disincentives to innovate and adopt new processes; and outmoded technology and equipment.

Information is sparse about economic results for 1981 and goals for 1982 and 1985 (and western analysts often express doubts about the reliability of official statistics). However, it appears that this year the Soviet and East European economies generally are continuing the slower growth of the past two years. Capital investment and imports of technology and plants are being cut back. And the outlook is for continued slow growth at least through 1985, as government leaders set less ambitious goals in their new five-year plans.

Thus, industrial production for the six East European nations (excluding the U.S.S.R.) rose just 2.5% in 1980, according to the United Nations Economic Commission for Europe (ECE), based on official national figures. This was less than half the target of 5.2% and represents a continuation of the slowdown in the region's industrial growth rates since 1976 (7.4% in 1976, 7.0% in 1977, 5.7% in 1978, and 4.4% in 1979). Furthermore, Central Intelligence Agency estimates of growth are even lower—2.7% in 1979 and 1.3% in 1980, for instance. (The CIA postulates upward bias in official figures due to double counting and disguised inflation.)

Industrial growth slowed in every East European country in 1980, according to ECE, particularly in Hungary (where output dropped 2% in 1980, compared to expansions of 3.0% in 1979, 4.9% in 1978, and 6.6% in 1977) and Poland (down 1.3% in 1980, compared to increases of 2.7% in 1979, 4.9% in 1978, 6.9% in 1977, and 9.3% in 1976). The contraction sharpened this year for Poland, with industrial production down 13% from 1980 for the first three quarters.

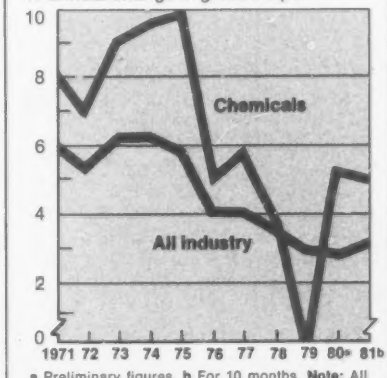
Beleaguered Poland's precipitous drop pulls down the region's overall results in two ways. First, it mathematically lowers the region's average growth rate. Thus, in the first half of 1981, according to ECE, industrial output of the six East European nations as a whole plummeted to a negative growth rate for the first time, declining 1% (the goal was a 4% rise). Five of the six nations increased their industrial output compared to last year (up between 2 and 6%), albeit at slower growth rates than in 1980. But Poland's decline more than outweighed the others' rise. Furthermore, Poland is an important supplier to its neighbors' industries, and failure in its deliveries directly affects their industrial output.

For the Soviet Union, U.S. government estimates show a slight slowing in growth of industrial production last year, as well as in 1979 (2.9% in 1980, 3.0% in 1979, and 3.5% in 1978). Industrial output thus failed to meet its target for 1980 of a 4.5% increase. This year, Soviet industrial production is growing at a slightly higher rate—3.3% through October. However, this still falls well short of the year's goal (4.1%).

Chemical and rubber industry production slowed last year, as well, in several East European countries. Chemical and rubber output in Hungary, for example, declined 0.1% in 1980, compared to increases of 6.1% in 1979 and 10.7% in 1978. However, production recovered somewhat in several countries from the general slump in 1979. Thus, Romania's chemical and rubber output rose 6.7% in 1980, compared to only 1.4% in 1979.

Chemical industry in the U.S.S.R. also rebounded, with 5.2% growth in production in 1980, compared to 0.2% in 1979, according to U.S. government calculations. However, this was still far short of the 1980 plan target of 9% growth, and well below the annual growth rates of 7 to 10% for chemical production racked up during the

Soviet chemical growth slower than in early 1970's



a Preliminary figures. b For 10 months. **Note:** All figures except for 1981 are based on Central Intelligence Agency estimates, giving lower results than official Soviet statistics because of postulated upward bias in Soviet figures. **Sources:** Central Intelligence Agency, U.S. Department of Commerce

U.S.S.R.'s ninth five-year plan (1971–75).

This year, Soviet chemical production through October is up 5.0% from the same period last year—just even with the year's target rate (although a bit below last year's 5.2% growth). However, production of some key chemicals is falling well short of targets.

For example, mineral fertilizer production, on a gross weight basis, rose 10% in 1980 (to 104 million metric tons), and 5% through August this year (compared to the same period in 1980), both seemingly respectable growth rates. However, the goal for 1980 was a 22% rise, to 115.3 million metric tons (and this target itself was scaled back drastically from the original five-year plan target of 143 million metric tons by 1980). And the 1981 target is a rise of 9.4%, to 113.8 million metric tons, compared to the 5% achieved through August of this year.

Making things worse for an already problem-plagued Soviet agriculture, pesticide production also continues to fall far short of targets. In 1980, output declined for the second straight year, down 1.1% to 470,000 metric tons. (The goal was 8% growth, to 512,000 metric tons, and this was a severe cutback from the original five-year plan goal of 615,000 metric tons.) This year, output is up 6% through October. However, 6% growth for the year would yield only 498,000 metric tons, still well short even of the goal for 1980.

Similarly, output through October this year of synthetic resins and plastics was 3.4 million metric tons, up a creditable 11% but still far below the rate of 18% needed to meet the year's goal of 4.3 million metric tons. And production of chemical fibers and yarns was up just 4% through October (to 1.013 million metric tons), making unlikely achievement of the year's goal of a 10% rise to about 1.3 million metric tons.

Thus, already before its first year is over, doubts are cast upon fulfillment of the supposedly moderate and more realistic goals of the 11th Soviet five-year plan. A few weeks ago, Nikolai K. Baibakov, chairman of the State Planning Committee (Gosplan), told the Supreme Soviet (the nominal Soviet parliament) that in 1981–85 industrial production will grow 26%, an average of nearly 5% a year. For 1982, the goal is 4.7% growth. Top priorities include food production, fuels (especially natural gas, to grow almost 50% by 1985), machine building and metal working, and the petrochemical and chemical industry.

Output of the chemical and petrochemical industry is to grow about 30 to 33% by 1985, an average of about 5.5 to 6% a year. Production of mineral fertilizers is to reach 150 million to 155 million metric tons (gross weight basis) by 1985—up 44 to 49% from production last year for an average annual growth of 7.5 to 8.3%. (The goal this year is 9.4%, but growth totaled only 5% through October.) And chemical fibers and yarns are to reach 1.6 million metric tons by 1985, up 33% from production in 1980, about 6% a year.

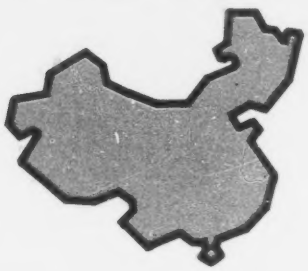
Meanwhile, Romania's five-year plan has set a target of 10.2% growth per year for its chemical industry. Czech output of chemicals is planned to increase a whopping 15% annually through 1985, with emphasis on value-added products, such as reinforced plastics, and ethylene, propylene, and other petrochemicals. Czech fertilizer production is to rise 13% a year. Bulgaria's investment in chemical industry will concentrate on production of polypropylene and ethylene glycol, with construction of a polyurethane complex also scheduled.

In the past, notes an ECE report, the Soviet and East European economies went through a period of extensive growth based on virtually unlimited labor and material inputs. This period is over, and all of these countries are reacting to it by bringing qualitative growth to the fore, including such factors as labor productivity, technical progress, and management efficiency. Thus, for example, Soviet leaders hope to attain almost 90% of their increased industrial output through 1985 by a 23% increase in labor productivity. Imports of machinery and know-how from the West obviously will be critical in such efforts. Indeed, Baibakov points out, the Soviet five-year plan calls for introduction of more than 2700 automated process control systems and 7300 computer complexes based on microprocessors and minicomputers. □

Soviet output of chemicals fails to match plans

Millions of metric tons unless otherwise noted	1981 Plan	1981 10-month result	1980 Plan	1980 Result	1979 Plan	1979 Result	1978 result
Mineral fertilizers[a]	na	21.9	na	24.8	na	22.1	23.7
% increase[b]	na	5%[c]	na	11.9%	na	−6.4%	0.7%
Sulfuric acid (100%)	na	19.9	na	23.0	na	22.4	22.4
% increase[b]	na	4%[c]	na	2.8%	na	−0.2%	6.2%
Sodium carbonate (100%)	na	na	na	4.8	na	4.8	4.9
% increase[b]	na	na	na	0%	na	−1.6%	−0.4%
Synthetic resins and plastics[d]	4.3	3.4	na	3.6	3.8+[e]	3.5	3.5
% increase[b]	18.3%	11%[c]	na	4.6%	9.3%[e]	−1.1%	6.3%
Sodium hydroxide (100%)	na	2.3	na	2.8	na	2.7	2.8
% increase[b]	na	0.2%[c]	na	2.8%	na	−3.0%	4.0%
Chemical fibers and yarns	1.3[e]	1.0	na	1.2	1.2[e]	1.1	1.1
% increase[b]	10.5%	4%[c]	na	6.9%	4.6%	−2.7%	4.0%
Pesticides and herbicides[f]	na	417	512	470	na	475	491
% increase	na	6%[c]	7.8%	−1.1%	na	−3.5%	1.0%
Automotive tires[g]	na	50.3	na	60.1	na	60.0	59.0
% increase[b]	na	0.1%[c]	na	0.2%	na	1.7%	2.8%

a On basis of nutrient content (N, P_2O_5, or K_2O, respectively); including some products used for technical purposes. b Increase or decrease from result in previous year. c Increase or decrease from 10-month result in previous year. d Including resins for man-made fibers. e Approximate. f In thousands of metric tons. g In millions of units. na = not available. **Source:** U.S. Department of Commerce, Central Intelligence Agency



China's economic readjustment is aimed at more selective growth

Output is down this year in chemicals and other heavy industries and investment in chemical plants has been slashed

Richard J. Seltzer, C&EN Washington

Three years ago, the People's Republic of China launched its "economic readjustment" program. Calling for sweeping restructuring of the economy and industry, introduction of aspects of a market economy, reallocation of resources, and slower, more selective growth, this policy was adopted after China found its underdeveloped industrial, agricultural, and educational systems incapable of implementing its ambitious development plans.

However, China now is confronting additional economic problems, some of them compounded by its economic reforms—including inflation, high unemployment, serious energy shortages, inadequate supplies of building and raw materials, large budget deficits, and excessive, inefficient investment spending. Thus, it is not surprising that Premier Zhao Ziyang announced earlier this month to the National People's Congress (NPC), China's nominal legislature, that the original three-year readjustment period, 1979–81, will be extended for at least five more years. It thus will cover the entire sixth five-year plan (1981–85) and lay the basis for more rapid growth later.

1981 has been a mixed year for China's industry, with light industry doing relatively well but heavy industry declining precipitously. For the first half of the year, overall industrial production rose just 0.8% compared to the same period last year. It is doubtful that even the relatively modest goal of 6% growth for the year will be met.

The readjustment policy calls for more priority for light and textile industries (producing for export and for consumer needs) and for less priority for heavy industry. Production in light industry rose 11.6% through June, compared to the same period in 1980. It is expected to be up for the year, surpassing the target of 8%. Textile industry output increased 15% through June. And production of goods for Chinese consumers soared—television sets up 100%, radios up 64%, cameras up 52%, and bicycles, watches, and sewing machines up about 25% each.

The main reason for the low growth of production overall, therefore, is an absolute decline by heavy industry. For the first half of this year, heavy industry's output dropped 8%. Heavy industry provided just under half of China's total industrial output during the first half of 1981, compared to 53% for all 1980 and 57% in 1979.

Production is lower this year than last year in numerous branches of heavy industry. For example, comparing the first eight months of 1981 with the same period of 1980, petroleum production is down 5.2%, coal 3.6%, natural gas 10.3%, steel 6.3%, power generating equipment 74%, machine tools 20%, motor vehicles 20.4%, tractors 43.1%, railroad freight cars 28.5%, and locomotives 21.7%.

Similar results are found in the chemical area. For instance, chemical fertilizer output dropped 3.9%, sodium hydroxide 4.9%, insecticides 9.2%, pharmaceuticals 18.8%, and rubber tires a whopping 44.5%. Two brighter spots are synthetic detergents (up 11%) and man-made fibers (up 16.5%).

Two factors are causing an economic decline in 1981—and probably also in the next few years—from the high growth rates of 1978–80, according to economist Nicholas Lardy of Yale University. First, a significant part of the 1978–80 growth in industrial output simply represented recovery from the troubled Cultural Revolution period.

Fertilizer, resins spur China's chemical trade deficit with U.S.

$ Millions[a]	Nine months 1981	1980	1979	1978	% change 1979–80
Total exports	$14,770	$19,588	$13,718	$10,086	43%
Total imports	14,180	19,348	14,283	10,321	35
World trade balance	590	240	−565	−235	—
Exports to U.S.	1,410	1,054	591	324	78
Imports from U.S.	2,677	3,754	1,724	821	118
Trade balance with U.S.	−1,267	−2,700	−1,133	−497	—
Chemical exports to U.S.	95	101	49	22	106
Inorganic chemicals	na	32	19	4	68
Essential oils	na	14	6	7	133
Chemical imports from U.S.	275	390	127	61	207
Inorganic chemicals	na	20	14	2	43
Synthetic resins	na	118	31	2	281
Fertilizer	na	153	45	39	240
Pesticides	na	32	19	10	68
Chemical trade balance with U.S.	−180	−289	−78	−39	—

a F.o.b. basis; figures generally are based on data from China's trading partners. na = not available. **Sources:** Central Intelligence Agency, U.S. Department of Commerce

In addition, Lardy points out, the Chinese government has not dealt adequately with structural problems, such as inefficient use of resources and declining energy production. Output of coal, petroleum, and natural gas has declined since 1979. China has not invested sufficiently to modernize coal production, despite huge coal reserves, and has not brought new oil fields into production rapidly enough to offset dropping production in existing fields.

China also has moved very slowly to bring offshore oil into production. (Public bidding is supposed to start early next year for the 48 firms from 13 countries that explored for oil off China.) Thus, China's oil production may not increase significantly until the late 1980's. This raises doubts both about availability of fuel and feedstock for its petrochemical industry and its ability to export oil to enable it to acquire foreign plants and technology. Moreover, China has done little until now to conserve energy or use it more efficiently.

It now appears that the Chinese are "readjusting the readjustment policy," as one China-watcher puts it. Concerned at the rapid decline in heavy industry's output, they realize that a heavy industry base is needed to support expansion of light industry and agriculture. Indeed Zhao told the NPC that heavy industry's output has begun to rise, and will be down only 5% from 1980 for all 1981. Next year, he expects heavy industry to show absolute growth.

Furthermore, to deal with its economic problems, China has reduced government spending and its budget deficit and has cut back capital construction. First priority in investment goes to light and textile industry, followed by the weak infrastructure sectors of energy, building materials, transport, and communications.

In fact, in late 1980 and early 1981, the Chinese suspended or canceled more than $2 billion worth of industrial plant purchases from abroad, more than 20% of their total plant orders since 1978. These included several petrochemical plants ($1.2 billion), steel-rolling mills ($700 million), and a copper smelter ($100 million). Two factors weighed heavily in the decision: lack of domestic funds for costs related to construction and infrastructure preparation and the likelihood of inadequate fuel and feedstock supplies for the plants.

About 60% of the contracts were with Japanese firms. These firms have since arranged a $1.3 billion credit package enabling work to continue on two projects—the Daqing petrochemical project and the Baoshan steel complex.

In general, China has lowered orders sharply for complete industrial plants, focusing instead on technology and equipment to upgrade existing facilities. And it is very interested in acquiring western equipment and technology through countertrade deals.

U.S.-China trade overall is expected to total about $5.5 billion to $5.8 billion this year, up from $4.8 billion in 1980. Although that is a hefty 15 to 20% rise, it still is a leveling off from the geometric rates of increase of previous years. China is already the U.S.'s largest communist trading partner (indeed, U.S.-China trade through August was 92% of total U.S. trade with the U.S.S.R. and its six East European allies). Trade with the U.S. constituted 14% of China's foreign trade through September.

U.S. exports to China (more than half of which are agricultural products) increased only slowly this year (up 4% through September), whereas U.S. imports soared 89%. (Much of the import increase was $180 million worth of peanuts because of the U.S. peanut shortage.)

U.S. chemical exports, totaling $275 million, contributed $180 million to the U.S. trade surplus of $1.3 billion through September. These figures, furthermore, do not include $401 million worth of man-made fibers exported by the U.S. through September.

In line with China's development priorities, agricultural chemicals, synthetic fibers for textile use, and plastic resins for consumer goods head the list of chemical-related U.S. exports. Indeed, noncontinuous polyester fibers ($208 million) and polyester continuous textured yarn ($111 million) rank third and fourth among all U.S. exports to China through September. Diammonium phosphate fertilizer ($56 million) ranks seventh and polyester resins ($28.6 million) is 10th. Also high on the list are polyester woven fabrics ($23.5 million), noncontinuous acrylic fiber ($23.4 million), polypropylene resins ($20.8 million), concentrated superphosphate ($14.7 million), urea ($13.3 million), dimethyl terephthalate ($11.7 million), insecticides ($11 million), polystyrene homopolymer resins ($10.7 million), and acrylonitrile-butadiene-styrene resins ($10.2 million).

U.S. chemical imports from China ($95.2 million through September) are dominated, as in previous years, by inorganic chemicals and natural products. Fireworks ($17.9 million) ranks ninth among all U.S. imports, and ammonium molybdate ($13.6 million) ranks 12th. Other top imports are ammonium tungstate ($4.8 million), antimony oxide ($3.9 million), menthol ($3.2 million), cassia oil ($3.2 million), synthetic vitamin B_1 ($3.2 million), gum rosin ($3.1 million), synthetic vitamin C ($1.9 million), and caffeine ($1.8 million). □

Output of many chemicals down this year

Thousands of metric tons, unless otherwise noted	Eight months 1981	Eight months 1980	% change 1980–81
Chemical fertilizer[a]	8243	8578	−3.9%
Nitrogen (N)	6499	6834	−4.9
Phosphate (P_2O_5)	1736	1653	5.0
Potassium (K_2O)	8	8	−2.5
Sulfuric acid (100%)	5089	5130	−0.8
Sodium hydroxide	1253	1318	−4.9
Sodium carbonate	1093	1083	0.9
Calcium carbide	955	985	−3.0
Plastics	602	612	−1.6
Insecticides	354	390	−9.2
Ethylene	336	330	1.8
Synthetic detergents	313	282	11.0
Man-made fibers	240	206	16.5
Pharmaceuticals	23	28	−18.6
Rubber tires (thousands of units)	4880	8793	−44.5

a Nutrient content basis. Source: U.S. Department of Commerce

Exports are the vital element in major chemical buildup

Middle East will become a bigger factor in world markets as new plants come on stream in Saudi Arabia and Israel

Dermot A. O'Sullivan, C&EN London
Richard J. Seltzer, C&EN Washington

When petrochemical executives talk of the Middle East, their thinking tends to focus predominantly on Saudi Arabia, for it is there that by far the largest concentration of plants will be sited in the near term.

During this past year, the government-owned Saudi Basic Industries Corp. (SABIC) signed agreements to build petrochemical plants with Celanese and Texas Eastern, Dow Chemical, and a Japanese consortium headed by Mitsubishi. With the signing, the final parts of a complex scheme that will lead to production of an extensive range of products took concrete shape. The present schedule calls for all units to be completed and running by 1986.

This year's three SABIC contracts entail plants that will go in at Al Jubail on the Persian Gulf. National Methanol Co., in which Celanese and Texas Eastern each have a 25% interest, will be designed to produce 1.4 billion lb annually of methanol. It will be sited near a 1.3 billion lb-a-year unit that Saudi Methanol Co., in which SABIC is partnered with a Japanese consortium, expects to bring on stream in 1983.

The complexes of Dow and the Mitsubishi-led consortium will be closely linked. Arabian Petrochemical Co., or Petrokemya, in which Dow has a 50% share, will build an ethane cracker with an annual ethylene output of 1.1 billion lb. Some of the output will go to make high- and linear low-density polyethylene. Combined annual capacity will be 396 million lb. Petrokemya's ethylene also will go to Eastern Petrochemical—called Sharq from the Arabic for "East"—50% owned by Mitsubishi and its Japanese partners to feed a 660 million lb-a-year ethylene glycol unit and a 286 million lb-a-year conventional low-density polyethylene plant.

Unless there is a change of plans, Petrokemya's cracker will have an annual ethylene output capability of about 90 million lb in excess of local need. This raises the question as to what use will be made of the additional quantity of the olefin. There is some speculation that Dow might try to acquire it for its petrochemical complex now going up at Krk, Yugoslavia. The Saudis, however, are believed to be opposed to ethylene as such leaving the country.

The two other complexes at Al Jubail involve Exxon and Shell Oil in partnership with SABIC. Exxon's Al Jubail Petrochemical, or Kemya, will make linear low-density polyethylene in a plant designed to produce 572 million lb annually. Shell Oil's Saudi Petrochemical, or Sadaf, will make a variety of chemicals, including ethylene (1.44 billion lb per year), ethanol (618 million lb), ethylene dichloride (1 billion lb), styrene (649 million lb), together with benzene, chlorine, and caustic soda. At Yanbu, on Saudi Arabia's west coast, Mobil and SABIC are partners in a complex that will make ethylene (990 million lb), glycol, and high-density and low-density polyethylene.

Saudi Arabia will use some of the output. But a considerable proportion will be exported. According to Abdul Aziz al-Zamil, SABIC's managing director, Japan and the U.S. are expected to absorb 20% each of such exports and Europe 22%. The 38% balance will go to the neighboring Middle Eastern countries and to Africa. Concern on the part of other producers, already laboring under the dual problem of excess installed capacities and low demand, hardly will be allayed by al-Zamil's contention that the Saudi projects "will not cause disruption to world markets."

In nearby Israel, meanwhile, this is not the best of times economically and industrially. Economic growth has slowed for the past three years. Inflation continues at a triple digit rate, although lower than in 1979 and 1980. Spurred by rapidly rising payments for imports of oil and defense equipment and market problems for some Israeli exports, Israel's balance of payments deficit is widening.

One bright spot in this dreary picture is that Israel's modern, high-technology industries, which produce primarily for export, are continuing to grow. Industrial exports, excluding processed diamonds, rose 29% in 1979 to $2.6 billion, and 31% in 1980 to $3.4 billion; $1 billion of the $3.4 billion was for products based on Israel's own research and development. In the first half of 1981, industrial exports totaled $1.7 billion, up 5.4% from the same period last year.

Israel's chemical industry (including rubber, plastics, and mineral products) accounts for almost a third both of total industrial production and of total industrial exports (excluding processed diamonds in both cases). Thus, Israel exported about $1 billion in chemical-related products in 1980, about 27% of its total output of about $3.8 billion.

Despite all the problems, chemical expansion plans are going ahead. By 1985, new capacity will be completed for potash, bromine and bromine compounds, phosphates, chlorine, caustic soda, phosphoric acid, and pesticides. The target is $6.3 billion in production of chemical-related products in 1983 and about $10 billion by 1990. Of this, $1.4 billion would be exported in 1983 and $2.6 billion in 1990. This postulates annual growth rates from 1980 to 1990 of 8% in chemical production and 10% in chemical exports. □

Other Areas

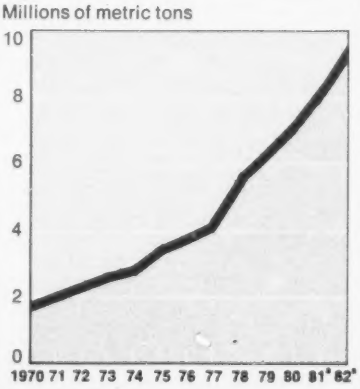
Mexican buildup aims for self-sufficiency

Cracks are beginning to appear in Mexico's yellow-brick road to oil-based prosperity. The skill with which the government handles its newly emerging economic and financial problems is likely to determine whether Mexico's high-flying chemical industry continues its hectic growth pace or stagnates.

Outwardly, all signs point to a booming economy. For the past four years, economic growth has averaged 8% annually. Oil production has doubled. New construction is evident throughout the country.

But there are other, much less encouraging signs. Mexico, now the world's fourth-largest oil producer, was hit with a combination of economic punches as a result of the current global oil glut and the cut of $4.00 per barrel in the price of its oil it implemented this past summer.

Mexico's petrochemical output continues to climb



* C&EN estimates. **Note:** Production of 37 primary petrochemicals produced exclusively by Petroleos Mexicanos (Pemex). **Source:** Pemex

As a result, Mexico lost billions in oil revenues and had to cut government spending. Its trade deficit is expected to reach $11 billion in 1981. Its foreign debt will top $60 billion this year, and next year, experts predict, Mexico will pass Brazil as the world's most indebted nation.

Through all of this, Mexico's chemical industry, especially petrochemicals, has continued to be one of the most dynamic sectors of industry, topped only by the oil industry itself.

Between 1975 and 1980, the value of Mexico's chemical output more than tripled, from $1.5 billion to $5.2 billion at current exchange rates. Through the first half of 1981, chemical production was up about 15%. Although that pace probably didn't last throughout the second half, annual output probably will increase 13%, falling just shy of $6 billion.

Not surprisingly, basic petrochemicals lead the chemical growth parade. Early indicators are that basic petrochemicals will increase 20% in value this year, followed closely by fiber intermediates at 17%.

Petroleos Mexicanos (Pemex), the government-owned oil company that, by law, controls output of basic petrochemicals, churned out 7.2 million metric tons of them last year. This year, output is expected to hit 8.3 million metric tons. Next year, with most of its new complex at La Congrejera coming on stream, Pemex probably will produce about 9.6 million metric tons of petrochemicals.

As impressive as these growth figures are, the chemical industry seems to be drifting further away from, rather than closer to, its cherished goal of achieving self-sufficiency for its domestic market and eliminating its troublesome trade deficit.

Over the past five years, growth of Mexico's chemical exports has outpaced growth of imports (an average 40% per year for exports vs. 35% for exports). Despite this, the chemical trade deficit has mushroomed from $304 million in 1975 to $1.3 billion last year. The outlook this year is worse.

Industry leaders are hoping that completion of the La Congrejera petrochemical complex and other major Pemex petrochemical projects being built or planned at Morelos, Altamira, Dos Bocas, and Laguna del Ostion, along with the heavy investment that is taking place in the secondary chemical industry, will quench Mexico's thirst for imported chemicals and will enable it to become a much more significant chemical exporter.

But the industry, along with much of Mexico's economy, faces some major hurdles. Price controls are cutting into return on investment. Financing is expensive and hard to come by. Transportation problems still have not been solved.

Government economic policy will dictate how successful the Mexican chemical industry will be in overcoming its problems. Will economic growth be moderated to combat inflation, or will the policy be one of full steam ahead, despite the inflationary consequences?

Compounding the uncertainty about the future is the fact that Mexico's president, José Lopez Portillo, has only one more year to serve. Then Miguel de la Madrid Hurtado will take over the president's office. Business community reaction to Madrid's selection has been favorable. But how he handles the Mexican economy may depend upon what shape he finds it in when he takes office.

Earl Anderson, New York

South Korea postpones chemical expansion

South Korea's chemical industry has had to contend with at least two significant developments this year. First, early in the year it began slowly to emerge from a recession that engulfed Korea for more than a year. And second, it had to deal with sharp cutbacks and shifts in expansion plans, as the government prepares to implement the country's new five-year plan.

Korea's recession began in 1979. Gross national product, which grew 10.5% in 1977 and 11.6% in 1978, slowed to an increase of 7.1%. And last year, a disastrous rice harvest combined with the world recession, oil price increases, and political turmoil following the October 1979 assassination of president Park Chung Hee to cause an unprecedented economic contraction, with GNP down 6%.

Output of many chemicals also declined during 1980, with ammonia down about 12%, urea fertilizers 16%, complex fertilizers 15%, and insecticides 9%. Now, Korean officials predict growth in GNP of 6 to 7% this year.

This recession intruded upon two extraordinary decades of economic development. Since 1962, Korea has been transformed by four five-year Economic Development Plans from

a marginally subsistent agricultural economy into one of the most advanced industrial countries of the developing world. Between 1962 and 1980, its GNP increased from $12.7 billion to $57.4 billion (at 1980 prices).

Exports provided the primary stimulus for Korea's growth and rapid industrialization, as its scarcity of natural resources and relatively small domestic market have spurred it into becoming one of the most active trading countries. Total exports soared from $55 million in 1962 to $17.5 billion in 1980.

Production and export of chemicals have shown similar growth, as Korea has built modern petrochemical, fertilizer, and textile industries. Chemical exports soared from $3 million in 1968 to $780 million in 1980.

Korea's petrochemical industry is integrated vertically around two naphtha cracking centers, one at Ulsan with 19 downstream plants and the other at Yeocheon with 15 downstream plants. They produced $1.9 million in petrochemicals last year. Originally, plans were to add further capacity and plants and to construct a third petrochemical complex, also at Yeocheon, under Korea's fifth five-year plan (1982–86).

On the other hand, Korea's petrochemical industry already is grappling with the problems of enormous cost increases for raw materials, overcapacity, and heavy inventories. It has suffered heavy losses.

In the end, the Korean government decided to postpone building the third complex and the additions, as well as other large projects. Instead, it set a slower growth target—of 7.6% annual growth in GNP from 1982 to 1986—and will divert some funds to lighter industries. Investments will go to expand capacity for synthetic fibers for the textile industry, for example.

Richard Seltzer, Washington

Taiwan to emphasize specialty chemicals

When the U.S. severed diplomatic relations with Taiwan in January 1979 and established "normalized" political relations with China, some observers wondered whether Taiwan's increased political isolation would adversely affect its booming economy and its fast expanding foreign trade. Now, almost three years later, the answer is clearly no.

On the contrary, Taiwan generally has continued its strong economic performance. Its current 10-year economic development plan (1980–89) envisions a further doubling of its real gross national product by 1989. Foreign investment continues to rise.

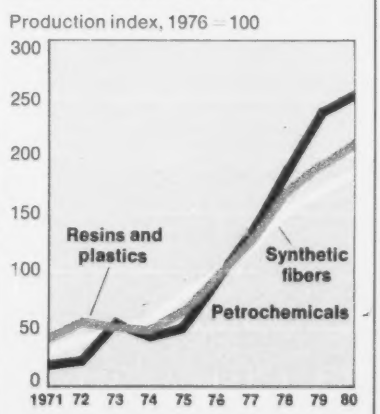
Over the past two decades, Taiwan has changed rapidly from an agricultural to an export-oriented, industrialized economy. Industrial emphasis in the 1970's passed from light industry consumer goods (such as electronics and plastic products) to backward integration into more sophisticated heavy industry, such as the petrochemical industry. Output of petrochemicals, synthetic fibers, and plastics has at least doubled since 1976. Most of the petrochemicals are exported, either directly or in processed goods.

In the 1980's, the economic development strategy will emphasize technology-intensive industries, including petroleum-based products with high added value (for example, engineering plastics and specialty chemicals and additives for the rubber, textile, plastic, pharmaceutical, agricultural, and electronic industries). In addition, under the 10-year plan, production of key petrochemicals, synthetic fibers, and plastics is to more than double—for instance, ethylene up from 420,000 metric tons in 1980 to 1.08 million in 1989. A fourth naphtha cracker, with 385,000 metric-ton-per-year capacity, is to go on stream in 1983.

However, 1980 was a relatively poor year (ethylene output grew only 5%, for example), and Taiwan's chemical industry faces several problems. Oil price hikes and the world slump in demand for petrochemical-related products have hurt. (Taiwan imports about 90% of its energy requirements.) Moreover, domestic prices of petrochemical feedstocks are much higher than world prices, endangering the competitive edge of Taiwan's downstream producers.

Richard Seltzer, Washington

Taiwan's chemical output has doubled since 1976



Source: Council for Economic Planning & Development, Taiwan

Indonesia spurs ASEAN region's rapid growth

At a time of widely slackening world economic growth, the five members of the Association of South East Asian Nations (ASEAN)—Indonesia, Malaysia, Philippines, Singapore, and Thailand—constitute the fastest growing region, economically, in the world. With a total population of more than 260 million, relative political stability, and free enterprise-oriented policies, ASEAN has increased its gross national product at an average rate of 7% a year for the past decade.

Indonesia, with a population of 150 million and rich resources of oil, gas, minerals, timber, rubber, and other materials, is by far the largest member of ASEAN. It racked up 80% of the group's balance of payments surplus last year—more than $2.7 billion—and projects a similar surplus this year. (Oil and liquefied natural gas sales constituted $17 billion of its $22 billion in exports.)

Prosperity has created a boom atmosphere. Total investment under the third five-year development plan (April 1979 to March 1984), is estimated at $69 billion, some $20 billion of it from foreign capital.

Major investments are planned for the petroleum, petrochemical, and fertilizer industries. Increased fertilizer capacity, based on abundant natural gas, already has eliminated import of urea fertilizer and made Indonesia a net fertilizer exporter. Two additional urea fertilizer plants are being built, each with 570,000 metric-ton-a-year capacity.

Overall, under the five-year plan, the industrial sector is to grow 11% a year in value added; strategic industries (chemicals, steel, and metal) are to grow 14% a year. Major projects include $3 billion for oil refinery expansion; $1.7 billion for a natural gas-based olefin petrochemical complex; $1.1 billion for a naphtha-based aromatics center; and $240 million for a natural gas-based, 1000 metric-ton-per-day methanol project.

Richard Seltzer, Washington

NOTE

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